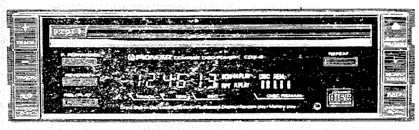
Service Manual



ORDER NO.
CRT1055

COMPONENT CAR STEREO COMPACT DISC PLAYER

CDX-2 EW

COMPACT
disc
DIGITAL AUDIO

CONTENTS

1. SPECIFICATIONS 1
2. SAFETY INFORMATION 2
3. NAME OF PARTS AND THEIR FUNCTIONS 3
4. READING THE DISPLAY 3
5. OPERATION 4
6. CONNECTION 4
7. PARTS LOCATION.......................5
8. DISASSEMBLY 6
9. MECHANISM DESCRIPTION................10
10. CIRCUIT DESCRIPTON 12
11. SCHEMATIC CIRCUIT DIAGRAM 54
12. CONNECTION DIAGRAM..................58
13. CHASSIS EXPLODED VIEW 65
14. CD MECHANISM UNIT EXPLODED VIEW......68
15. ELECTRICAL PARTS LIST 71
16. PACKING METHOD 74
17. ADJUSTMENT.........................75

PIONEER ELECTRONIC CORPORATION 4-1, Meguro 1-Chome, Meguro-ku, Tokyo 153, Japan
PIONEER ELECTRONICS SERVICE INC. P.O. Box 1760, Long Beach, California 90801 U.S.A. TEL: (213) 420-5700
PIONEER ELECTRONIC (EUROPE) N.V. Keetberglaan 1, 2740 Beveren, Belgium TEL: 03/775·28·08
PIONEER ELECTRONICS AUSTRALIA PTY. LTD. 178-184 Boundary Road, Braeside, Victoria 3195, Australia
TEL: (03) 580-9911

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• CD Player Service Precautions

1. Since this screw protects the mechanism during transport, be sure to affix it when it is transported for repair, etc.

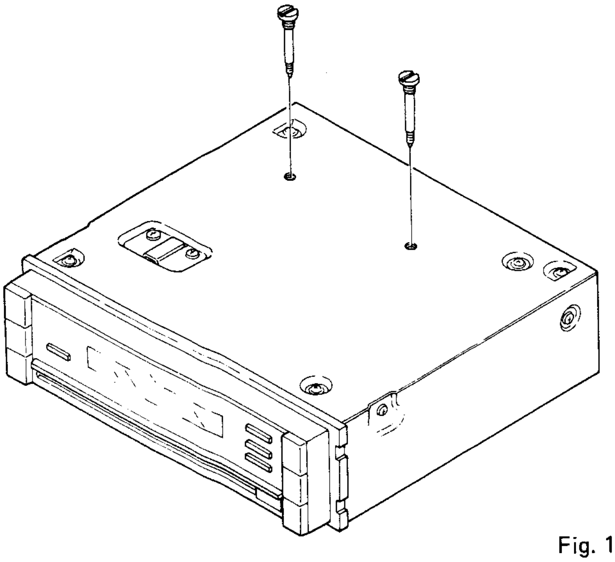


Fig. 1

2. For pickup unit (CGY1001) handling, please refer to "Disassembly" (Fig. 13). During replacement, handling precautions shall be taken to prevent an electrostatic discharge (protection by a short pin).
3. During disassembly, be sure to turn the power off since an internal IC might be destroyed when a connector is plugged or unplugged.

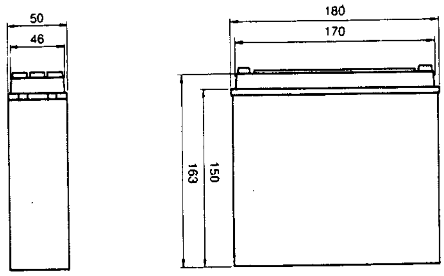
1. SPECIFICATIONS

General

System . . .Motor vehicle compact disc digital audio system
Disc . . . . Diameter: 120 mm
Thickness: 1.2 mm
Maximum playing time: Over 60 minutes (stereo)
Linear velocity: 1.2 – 1.4 m/sec.
Rotation direction: Counterclockwise
Signal format . . . . Sampling frequency: 44.1 kHz
Number of quantization bits: 16; linear
Transmission bit rate: 4.3218 Mbit/sec.
Modulation system: EFM
Error correction system: CIRC
Pre-emphasis: 50/15 μsec.
Laser. . . . . .Semiconductor laser: wavelength 790 nm
Power requirements. . .14.4 V DC (10.8 – 15.6 V possible)
Power consumption . . . . 8 W
Maximum power consumption. . . . . 16 W
Weight. . . . . 1.7 kg
Dimensions . . . . 180(W)x50(H)x163(D) mm

Audio

Frequency characteristics . . . . 5 – 20,000 Hz (±1 dB)
Signal-to-noise ratio. . . . . 90 dB (1 kHz) (IEC-A network)
Dynamic range . . . . 90 dB (1 kHz)
Wow and flutter . . . . Below measurement range
Distortion factor . . . . 0.005% (1 kHz, 0 dB)
Output voltage . . . . .200 mV (1 kHz, 0 dB)
Number of channels. 2 (stereo)



Note:
Specifications and the design are subject to possible modification without notice due to improvements.

2. SAFETY INFORMATION

1. Safety Precautions for those who Service this Unit.

- Follow the adjustment steps (see pages 78 through 85) in the service manual when servicing this unit. Whe checking or adjusting the emitting power of the laser diode exercise caution in order to get safe, reliable results.

Caution:

1. During repair or tests, minimum distance of 13cm from the focus lens must be kept.
2. During repair or tests, do not view laser beam for 10 seconds or longer.

2. A "CLASS 1 LASER PRODUCT" label is affixed to the bottom of the player. (Fig. 2)

- Two screws are affixed to the bottom of the unit to secure the mechanism during transport. Be sure to remove these screws before installation of the player. (Fig. 2)

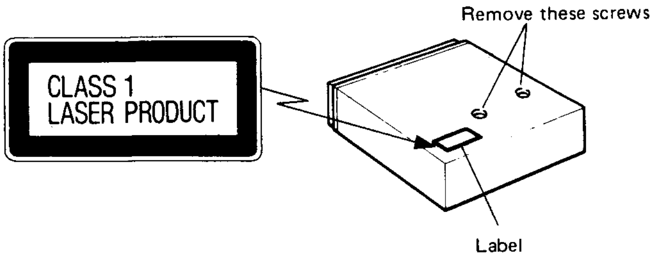


Fig. 2

3. The triangular label is attached to the mechanism unit plate unit (Fig. 3)

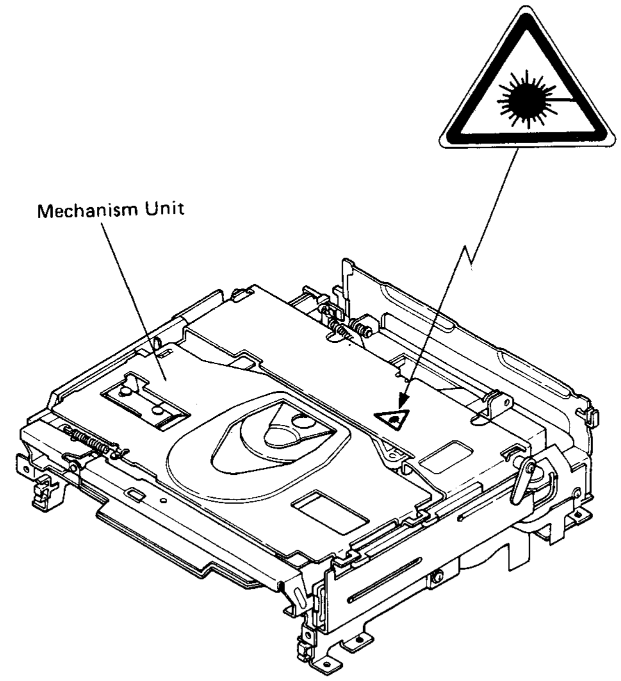


Fig. 3

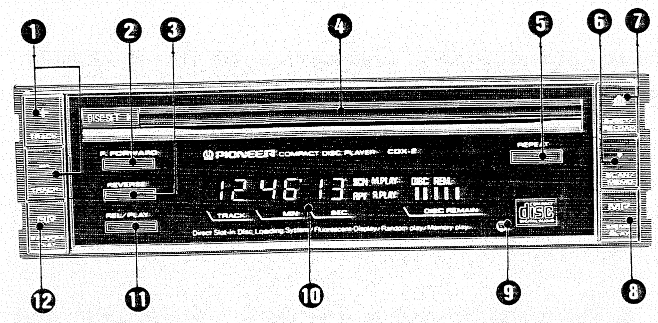
4. **Specifications of Laser Diode**

Specifications of laser radiation fields to which human access is possible during service.

Wavelength = 780 nanometers
Radiant power = 55.3 microwatts
(Through a circular aperture stop having a diameter of 80 millimeters)

0.44 microwatts
(Through a circular aperture stop having a diameter of 7 millimeters)

3. NAME OF PARTS AND THEIR FUNCTIONS



❶ Track Number Search Button

Press to search for a specific selection (track number). Each press of the (+) side increases the displayed track number, while pressing the (−) side decreases the number. Holding down either side of this button causes the displayed number to successively change at high speed.

❷ Fast Forward Button

Press to advance the present selection at high speed. Play resumes when the next selection (track number) is reached. Holding down the button causes fast forward to continue even after the next selection is reached.

❸ Reverse Button

Press to reverse the present selection at high speed. Play resumes when the beginning of the present selection (track number) is reached. Holding down the button causes reverse to continue even after the beginning of the present selection is reached.

❹ Disc Insert Slot

Discs are loaded into the unit with the label on the disc facing up. Once a disc is inserted into the disc insert slot, it is automatically set and play begins.

- Turn the cassette deck power switch or the tuner power switch to the OFF position.

❺ Music Repeat Button

Press to repeat the current selection a number of times. Either the release button or the music repeat button can be used to cancel the music repeat operation once it is activated. All selections on a disc are continuously played when the music repeat function is not activated.

❻ Track Scan/Memory Button

Press once to play the beginning (approximately 10 seconds) of each selection from the current selection (track scan). Pressing again during track scan records the number of the current selection in memory (scan memory) for playback during memory play.

Track Scan

Press to play the beginning (approximately 10 seconds) of each selection in order. Pressing the release button when the desired selection is found releases track scan and returns to normal play. Track scan is automatically released and normal play resumes when the selection during which track scan was originally selected is reached again.

Scan Memory

Press during play of the beginning (approximately 10 seconds) of a selection to record the selection in memory. Up to eight selections can be stored in memory.

- Up to eight selections can be stored in memory. A beep is heard when the memory button is pressed to indicate a full memory. Storing a selection in memory automatically deletes any selection previously stored.

❼ Eject/Reload Button

Press to eject a disc from the unit. Pressing again reloads the disc into the unit.

❽ Memory Play Button

Press to play the selections stored in the scan memory.

❾ Clear Button

Press with a thin pointed object when the effects of noise on the built-in micro computer make it impossible to turn the power of the unit ON, cause other buttons to become inoperative or results in an abnormal display.

❿ Display

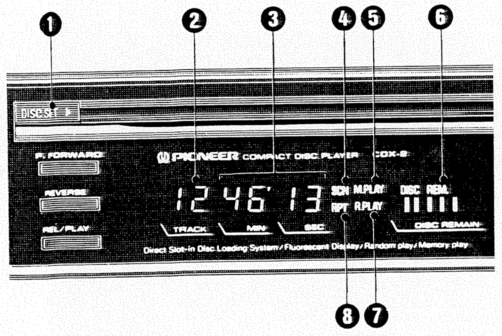
⓫ Release/Play Button

Press to cancel track scan, music repeat, fast forward, and reverse. Also suspends operation during random play, memory play, and play. Pressing again resumes play from the spot where it was originally suspended.

⓬ Random Play Button

Press to cause random selection and play from among the track numbers stored in the micro computer.

4. READING THE DISPLAY


❶
❷
❸
❹❺
❻
DISC SET
F. FORWARD
REVERSE
REL/PLAY
PIONEER COMPACT DISC PLAYER CDX-2
SCN M.PLAY
RPT R.PLAY
DISC REM.
TRACK
MIN
SEC
DISC REMAIN
Direct Slot-in Disc Loading System/Fluorescent Display/Random play/Memory play
❽❼

❶ Disc Set Display

Lights when a disc is set in the unit.

❷ Track Display

Indicates the track number of the selection being played. Also shows the total number of tracks included on a disc for approximately five seconds after the disc is loaded into the unit.

❸ Play Time Display

Indicates the elapsed play time of the selection being played. Also shows the total play time for a discs for approximately five seconds after the disc is loaded into the unit.

❹ Track Scan Display

Lights when the track scan/memory button is pressed and remains lit while the track scan/memory functions are in operation.

❺ Memory Play Display

Lights when the memory play button is pressed and remains lit while the memory play function is in operation. This indicator will not light and memory play will be impossible when there is nothing stored in memory.

❻ Disc Remain Display

Indicates the total play time remaining on the disc being played.

❼ Random Play Display

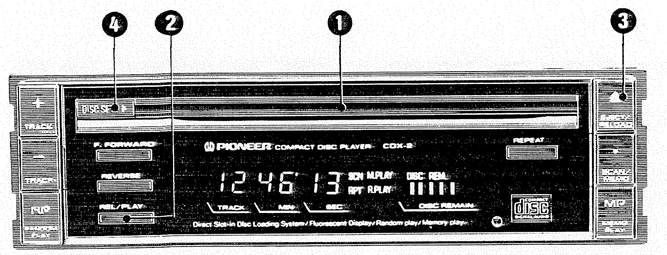
Lights when the random play button is pressed and remains lit while the random play function is in operation.

❽ Music Repeat Display

Lights when the music repeat button is pressed and remains lit while the music repeat function is in operation.

- A built-in function protects the semiconductor laser from damage by automatically suspending play when the ambient temperature of the unit exceeds a certain level. This condition is indicated by HHH HHH being shown on displays ❷ and ❸. The disc should be ejected and the unit should not be used until the ambient temperature is reduced.
- When a space of a few seconds exists between the selections of the disc being used, ❸ will show −'02, −'01 when the spaces are passed.

5. OPERATION


❹
❷
❶
❸
DISC SET
F. FORWARD
REVERSE
REL/PLAY
PIONEER COMPACT DISC PLAYER CDX-2
REPEAT
TRACK
MIN
SEC
DISC REMAIN
EJECT/RELOAD
compact disc
Direct Slot-in Disc Loading System / Fluorescent Display / Random play / Memory play

- Turn the cassette deck power switch or the tuner power switch to the OFF position.

1. Load a disc into the disc insert slot ❶ with the label on the disc facing up. Once a disc is inserted into the unit, it is automatically set and play begins. (The total number of selections on the disc and total disc play time will appear on the display for approximately five seconds.)
2. Set the volume, balance, bass and treble to the desired level using the cassette deck controls.
3. Press the release/play button ❷ to stop play without ejecting the disc. Pressing the release/play button again will resume play from the point at which it was stopped. Press the eject/reload button ❸ to stop play and eject the disc. Pressing the eject/reload button while the disc is still in the ejected position will reload the disc and resume play from the first selection.

- A short period of time will pass from when the disc is loaded to the point at which play begins. This "setting" time is required to allow the unit to begin reading the digital signals on the disc.
- The cassette tape deck and tuner can be used while a disc is in the set position.
- DISC SET ❹ is illuminated on the display while a disc is set. Note that attempting to load another disc while one is already set can damage the discs and cause malfunction.
- Never attempt to load two discs at the same time. This can cause serious malfunction of the unit.

6. CONNECTION

- Before making final connections, make temporary connections then operate the unit to check for any connecting cord problems.
- Refer to the instruction manual for details on connecting the various cords of the deck and main amp then make connections correctly.
- Be sure to correctly connect the memory power supply lead (orange) and main power supply lead (red) as specified. If the connections are made incorrectly or forgotten, this unit will not work at all.
- Don't pass the memory power supply lead through a hole into the engine compartment to connect to the battery. This will damage the lead insulation and cause a very dangerous short.
- If you should encounter more than two lead wires of the same color, when wiring connections, it will be convenient to wire them together, as shown in the following diagram.

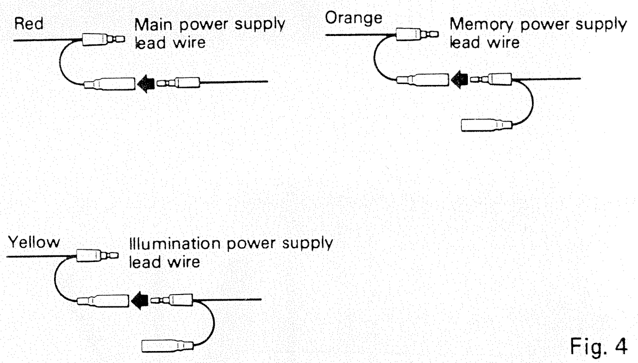
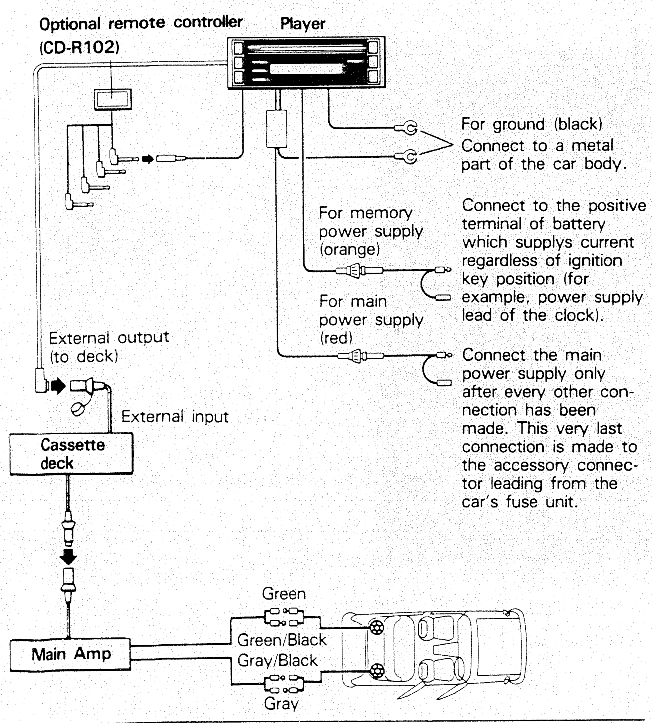

Red
Main power supply lead wire
Orange
Memory power supply lead wire
Yellow
Illumination power supply lead wire

Fig. 4

Example wiring with component car stereo cassette deck.


Optional remote controller (CD-R102)
Player
For memory power supply (orange)
For main power supply (red)
External output (to deck)
External input
Cassette deck
Main Amp
Green
Green/Black
Gray/Black
Gray

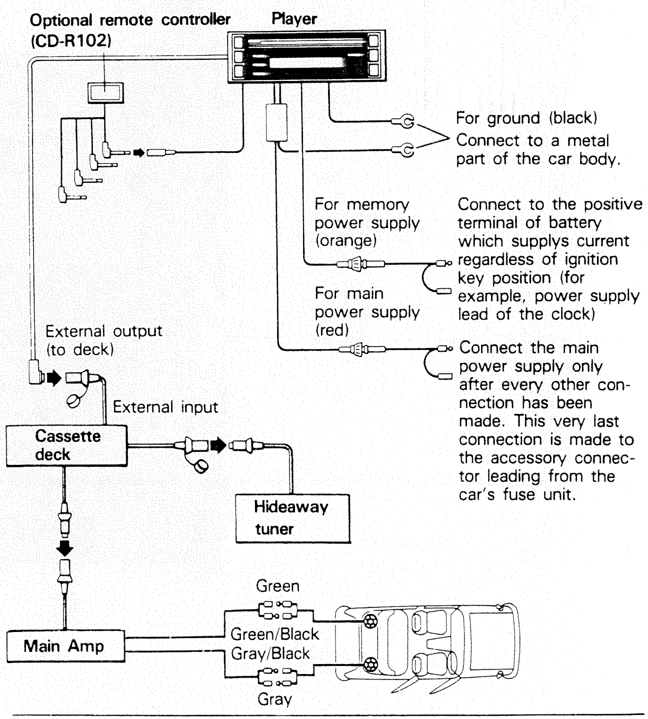
For ground (black) Connect to a metal part of the car body.

Connect to the positive terminal of battery which supplys current regardless of ignition key position (for example, power supply lead of the clock).

Connect the main power supply only after every other connection has been made. This very last connection is made to the accessory connector leading from the car's fuse unit.

Fig. 5

Example wiring with CENTRATE component car stereo cassette deck.


Optional remote controller (CD-R102)
Player
For memory power supply (orange)
For main power supply (red)
External output (to deck)
External input
Cassette deck
Hideaway tuner
Main Amp
Green
Green/Black
Gray/Black
Gray

For ground (black) Connect to a metal part of the car body.

Connect to the positive terminal of battery which supplys current regardless of ignition key position (for example, power supply lead of the clock).

Connect the main power supply only after every other connection has been made. This very last connection is made to the accessory connector leading from the car's fuse unit.

Fig. 6

7. PARTS LOCATION

NOTE:

- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★: GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

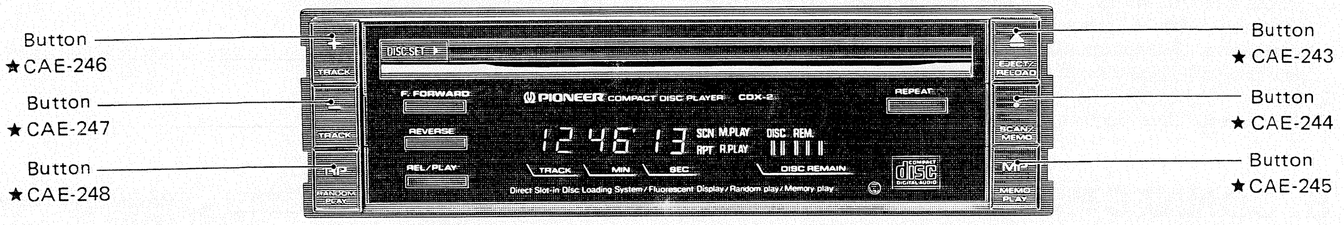

Button
★CAE-246
Button
★CAE-247
Button
★CAE-248
Button
★CAE-243
Button
★CAE-244
Button
★CAE-245
DISC SET
TRACK
F. FORWARD
PIONEER COMPACT DISC PLAYER CDX-2
REPEAT
EJECT/RELOAD
REVERSE
SCAN/MEMO
REL/PLAY
RANDOM PLAY
MEMO PLAY
TRACK MIN SEC
DISC REMAIN
Direct Slot-in Disc Loading System/Fluorescent Display/Random play/Memory play

Fig. 7

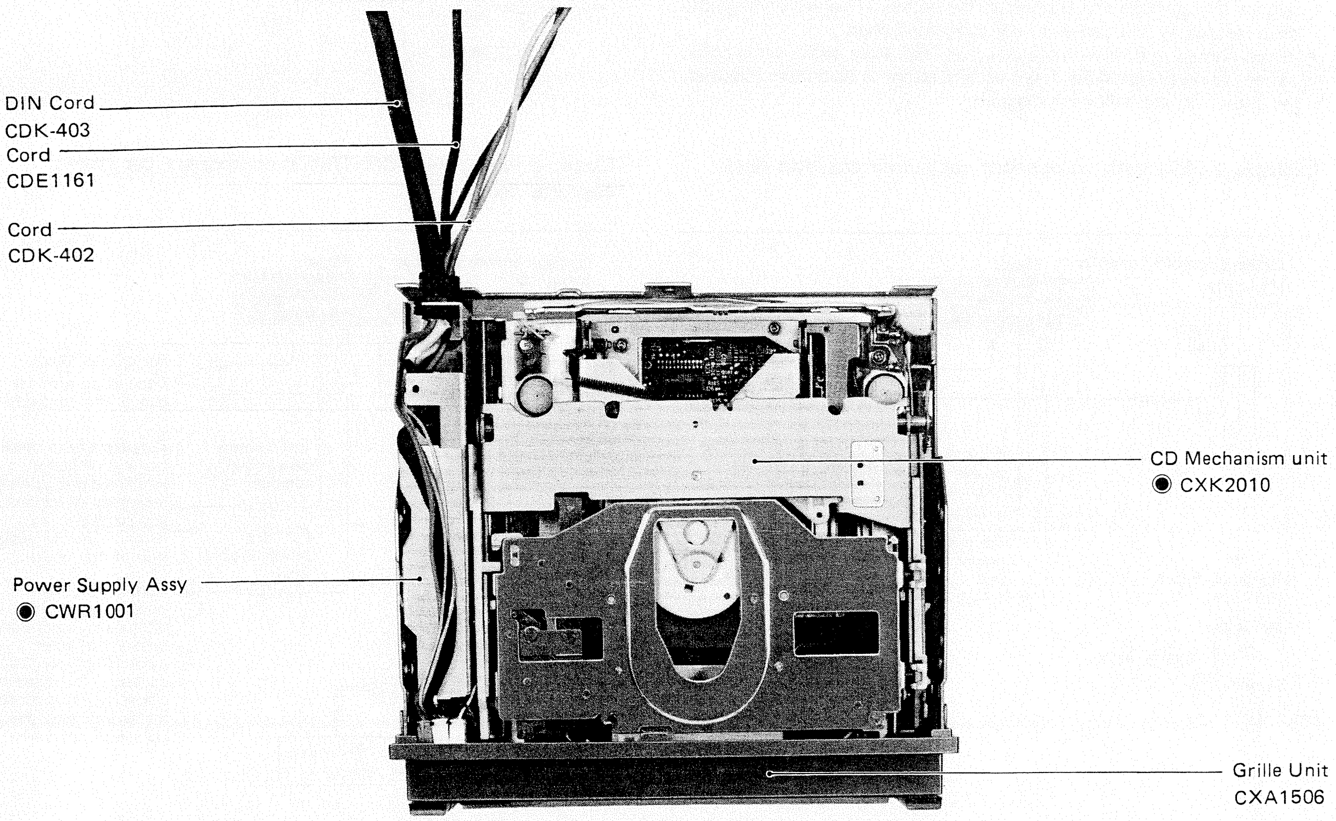

DIN Cord
CDK-403
Cord
CDE1161
Cord
CDK-402
CD Mechanism unit
◉ CXK2010
Power Supply Assy
◉ CWR1001
Grille Unit
CXA1506

Fig. 8

8. DISASSEMBLY

• Case Removal (Fig. 9)

1. Remove 4 screws, then remove the case.

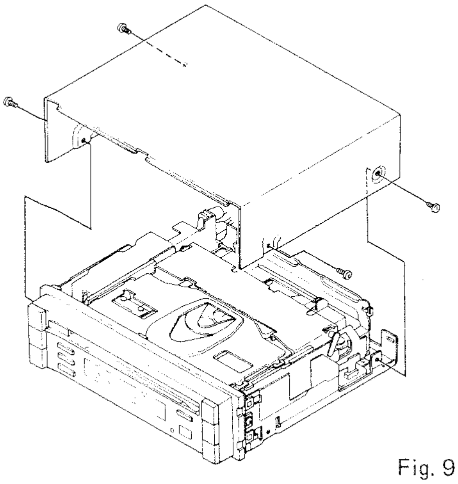
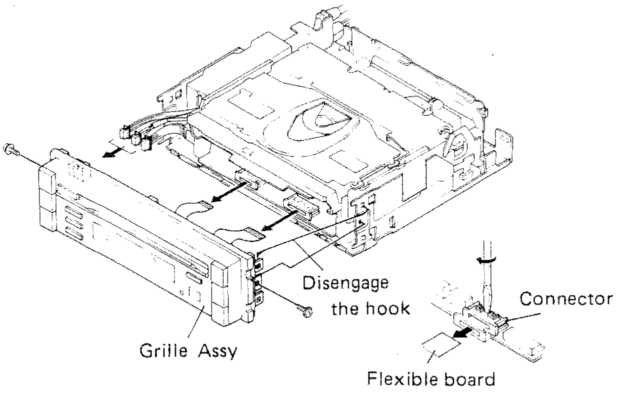


Fig. 9

• Grille Assy Removal (Fig. 10)

1. Remove 2 screws and release 4 catches, then remove the grille assembly.
2. Remove 5 connectors.


Disengage the hook
Connector
Grille Assy
Flexible board

Insert a (−) screwdriver and turn it in the arrow direction, then two connector catches come off and the flexible circuit board can be removed.

Fig. 10

• Display Unit Removal (Fig. 11)

1. Crush the holder (Fig. 11) by using pliers to allow the circuit board to be lifted.
2. Remove 6 screws, then remove the display unit.

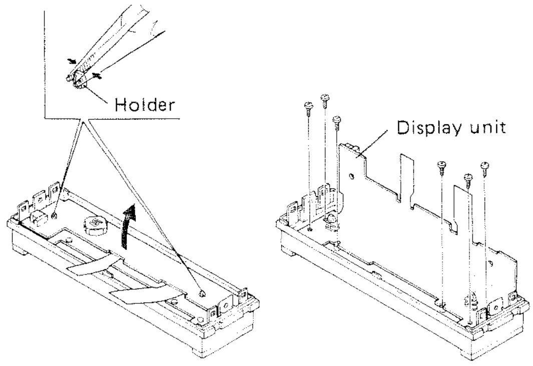

Holder
Display unit

Fig. 11

• Chassis Removal (Fig. 12)

1. Turn the set the other way.
2. Remove 8 screws, then remove the chassis.

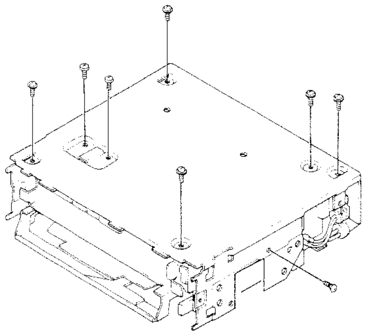


Fig. 12

• Mechanism Unit Removal (Fig. 13)

1. Remove 4 screws.
2. Remove 5 connectors.

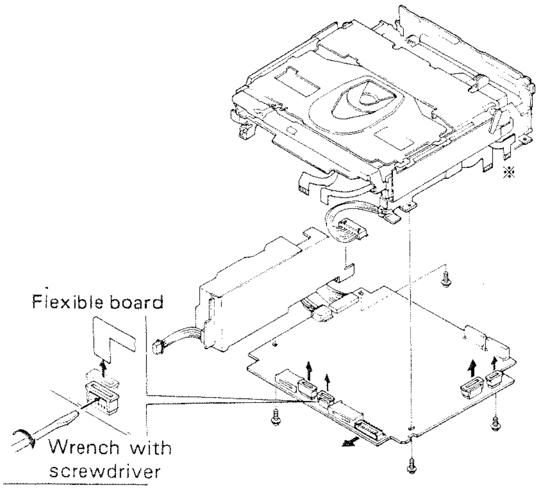

※
Flexible board
Wrench with screwdriver

Fig. 13-1

※

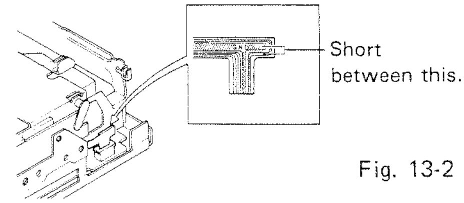

Short between this.

Fig. 13-2

When this connector (CN2, wiring to the semi conducter laser) is removed because the mechanism has to be removed, be sure to apply a shorting pin or short between the patterns with a jumper before removal.
When it is reconnected, connect it to the connecter, then remove the shorting pin or jumper.

• Loading Motor Unit Removal (Fig. 14)

1. Remove the screw (M2.6 x 4) at A, then remove the guide and gear unit.
2. Remove 2 screws (M2 x 2.5) at B, then remove the loading motor unit.

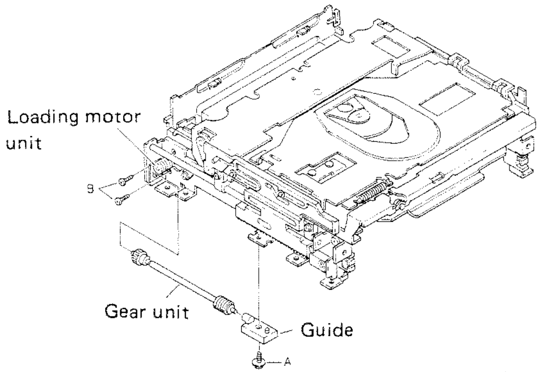

Loading motor unit
B
Gear unit
Guide
A

Fig. 14

• Clamper Plate Unit Removal (Fig. 15)

1. Remove 1 screw (M2 x 4) at P, then remove the flexible circuit board (to prevent circuit board cutting).
   * To tighten the screw at P, use a screw tightener.
2. Remove 2 screws (M2.6 x 4) at C, then remove a bracket.
3. Remove 1 screw (M2.6 x 4) at D, then remove a bracket (for a switch).
4. Remove the clamper plate unit toward the back as shown by an arrow while avoiding arm E and plate Q.

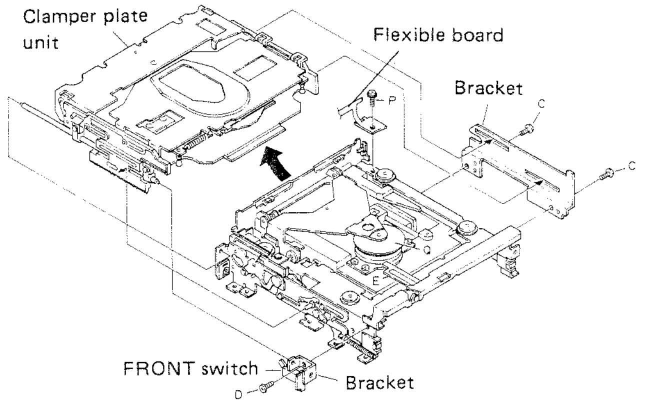

Clamper plate unit
Flexible board
P
Bracket
C
C
E
FRONT switch
D
Bracket

Fig. 15

• Vibration Proof Rubber (Bush) Removal (Fig. 16)

1. Remove the collar, then remove 4 screws (M2.6 x 5) at F.
   * Use a tightener to tighten the screw at F.
2. Remove the carriage mechanism unit.
3. Remove the bushing toward the bottom.

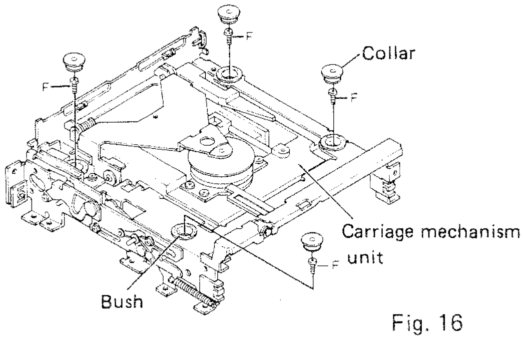

F
Collar
F
F
Carriage mechanism unit
F
Bush

Fig. 16

• Carriage Mechanism Unit Removal (Fig. 17)

1. Turn the mechanism the other way.
2. Remove 2 screws (M2.6 x 5) at G, then remove the carriage mechanism unit as shown by an arrow.
   * Use a tightener to tighten the screws at G.

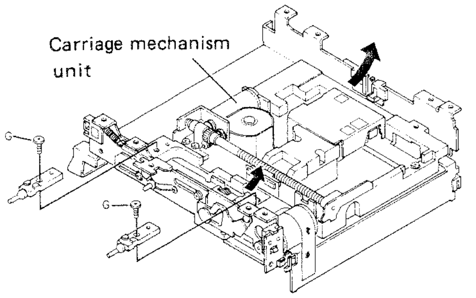

Carriage mechanism unit
G
G

Fig. 17

• Spindle Motor Removal (Fig. 18)

1. Lower the pickup unit toward the back. (It can be shifted manually if shaft deviation is performed as shown in Fig. 19.)
2. Remove 3 screws (M2.6 x 4) at H, then remove the spindle motor as shown by an arrow.

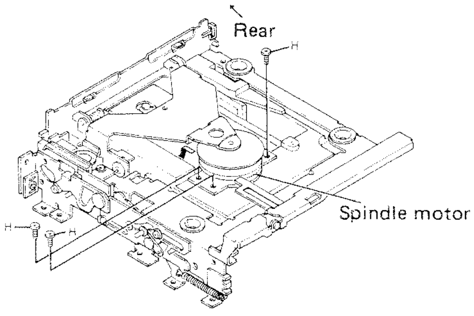

Rear
H
Spindle motor
H
H

Fig. 18

• Pickup Unit Removal (Fig. 19)

1. Turn the mechanism the other way.
2. Remove 2 screws (M2 x 4) at J, then remove the holder shaft.
3. Remove 1 screw (M2 x 4) at K, then remove the holder.
4. Remove the pickup unit.

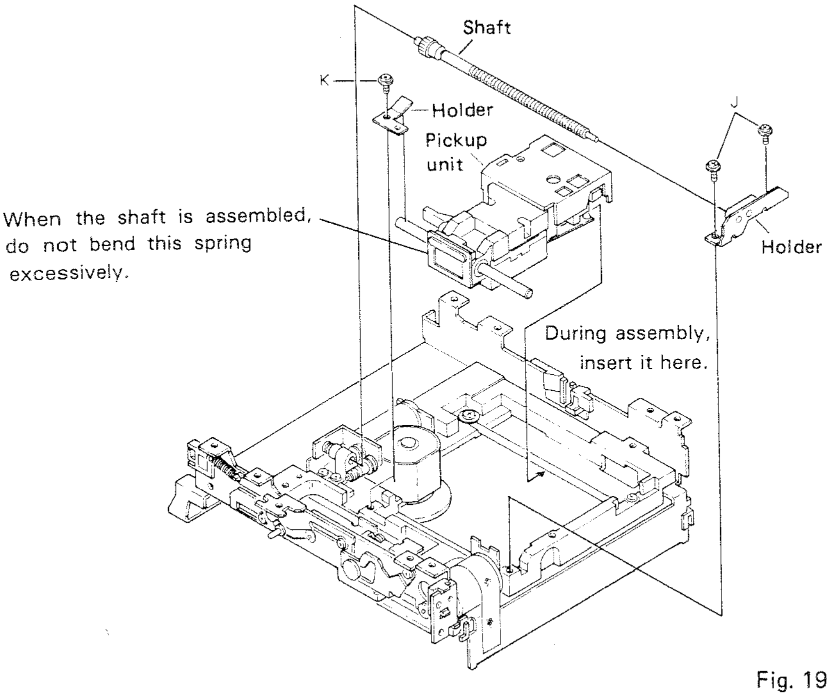

Shaft
K
Holder
Pickup unit
J
Holder
When the shaft is assembled, do not bend this spring excessively.
During assembly, insert it here.

Fig. 19

• Carriage Motor Unit Removal (Fig. 20)

1. Remove 2 screws (M2 x 4) at L and 1 screw (M2 x 4) at M, then remove the carriage motor unit.

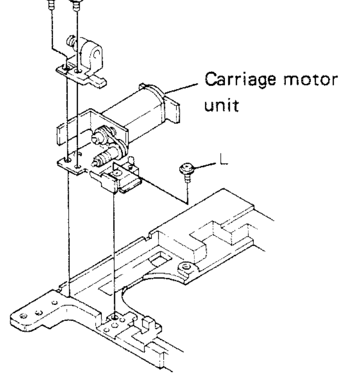

L
M
Carriage motor unit
L

Fig. 20

9. MECHANISM DESCRIPTION

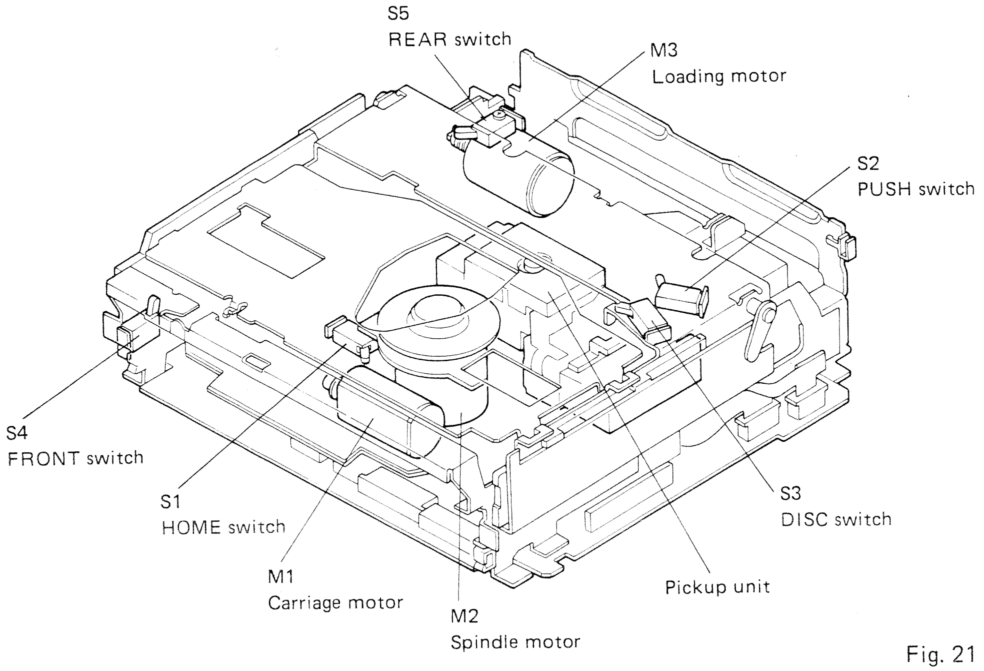

S5
REAR switch
M3
Loading motor
S2
PUSH switch
S4
FRONT switch
S1
HOME switch
S3
DISC switch
M1
Carriage motor
Pickup unit
M2
Spindle motor

Fig. 21

1. When a disc is inserted, it is supported at point A, B and C. At the same time, a lever moves toward the arrow direction and the DISC switch is opened (Fig. 22).
2. When the disc is pushed further, a PUSH switch is turned on and the loading motor rotates to start loading (Fig. 22).

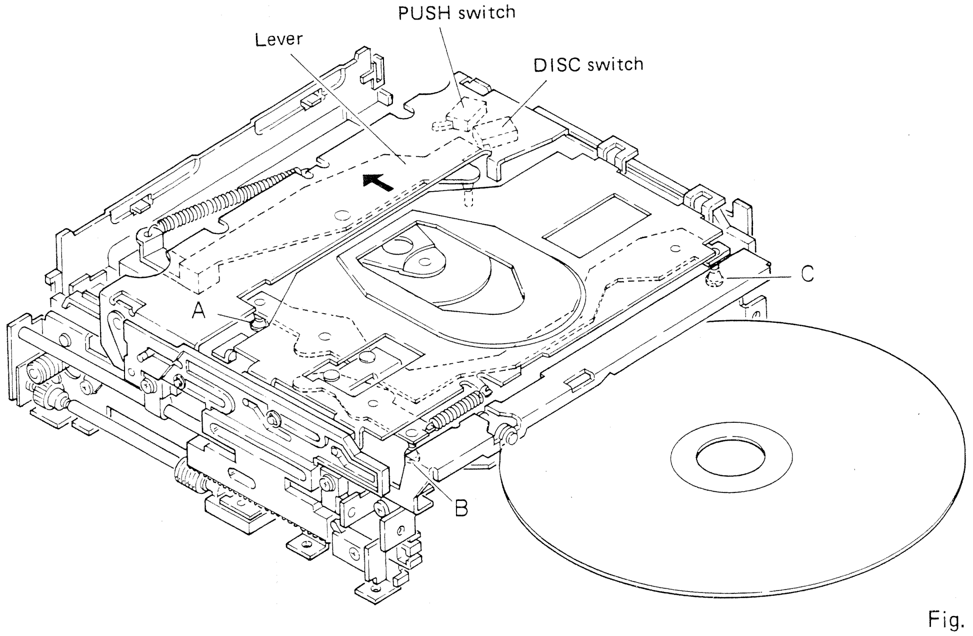

PUSH switch
Lever
DISC switch
C
A
B

Fig. 22

3. A lever and plate unit are shifted toward the arrow direction, then the FRONT switch is opened (Fig. 23).
4. When the center of the disc comes to the spindle motor, plate unit movement toward the back is terminated and it is then shifted down by the pins of D and E (Fig. 23).
5. A lever moves further toward the back which widens point A, B and C (Fig. 22) using pin F and frees the disc (Fig. 23).

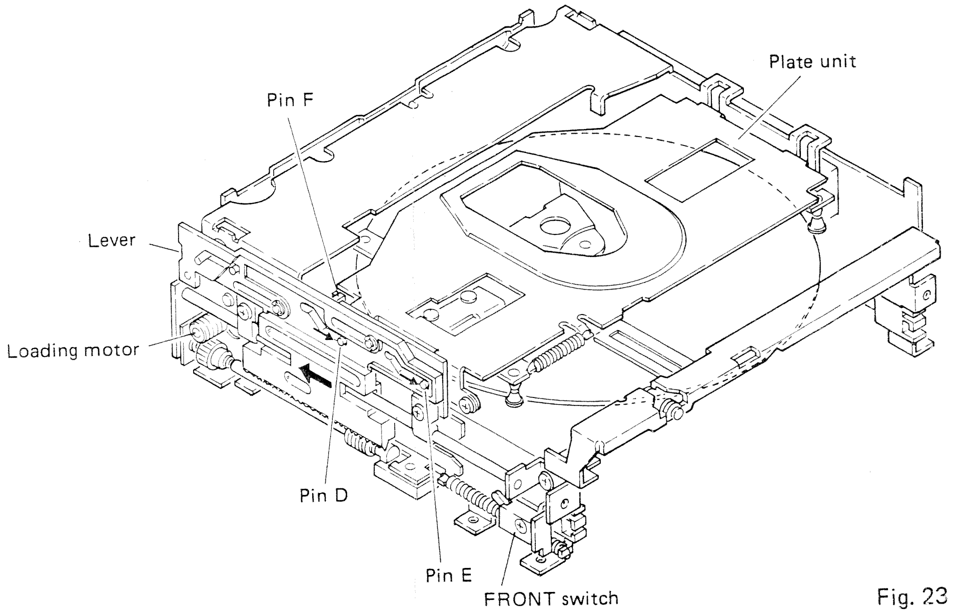


Plate unit
Pin F
Lever
Loading motor
Pin D
Pin E
FRONT switch

Fig. 23

6. A lever unit is moved toward the back by pin G the same as the lever. An arm unit presses the spindle motor shaft with spring L because pin H moves in the arrow direction, then a magnet holds the disc. After this, pin J and K become free and the die cast chassis becomes vibration proof. Also, the REAR switch is turned on and the loading motor stops to complete the loading operation (Fig. 24).

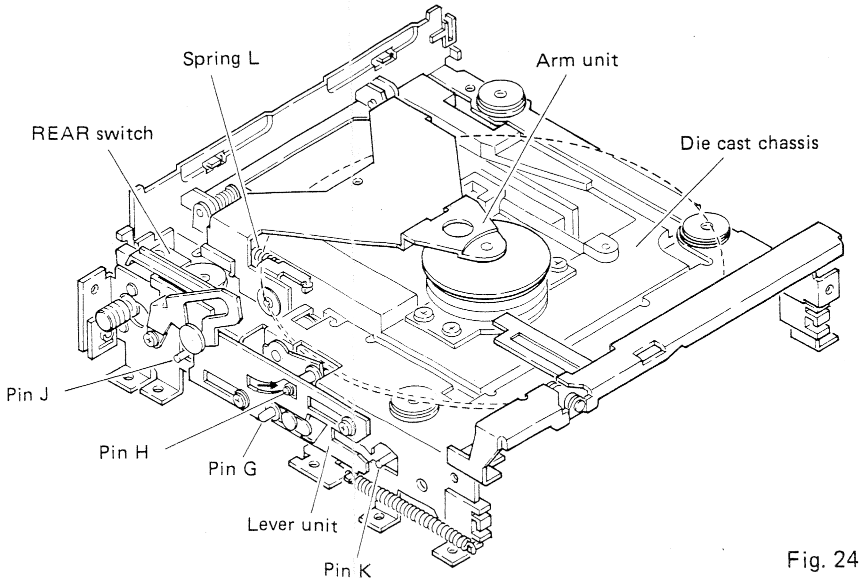

Spring L
Arm unit
REAR switch
Die cast chassis
Pin J
Pin H
Pin G
Lever unit
Pin K

Fig. 24

10. CIRCUIT DESCRIPTION

- Block Diagram

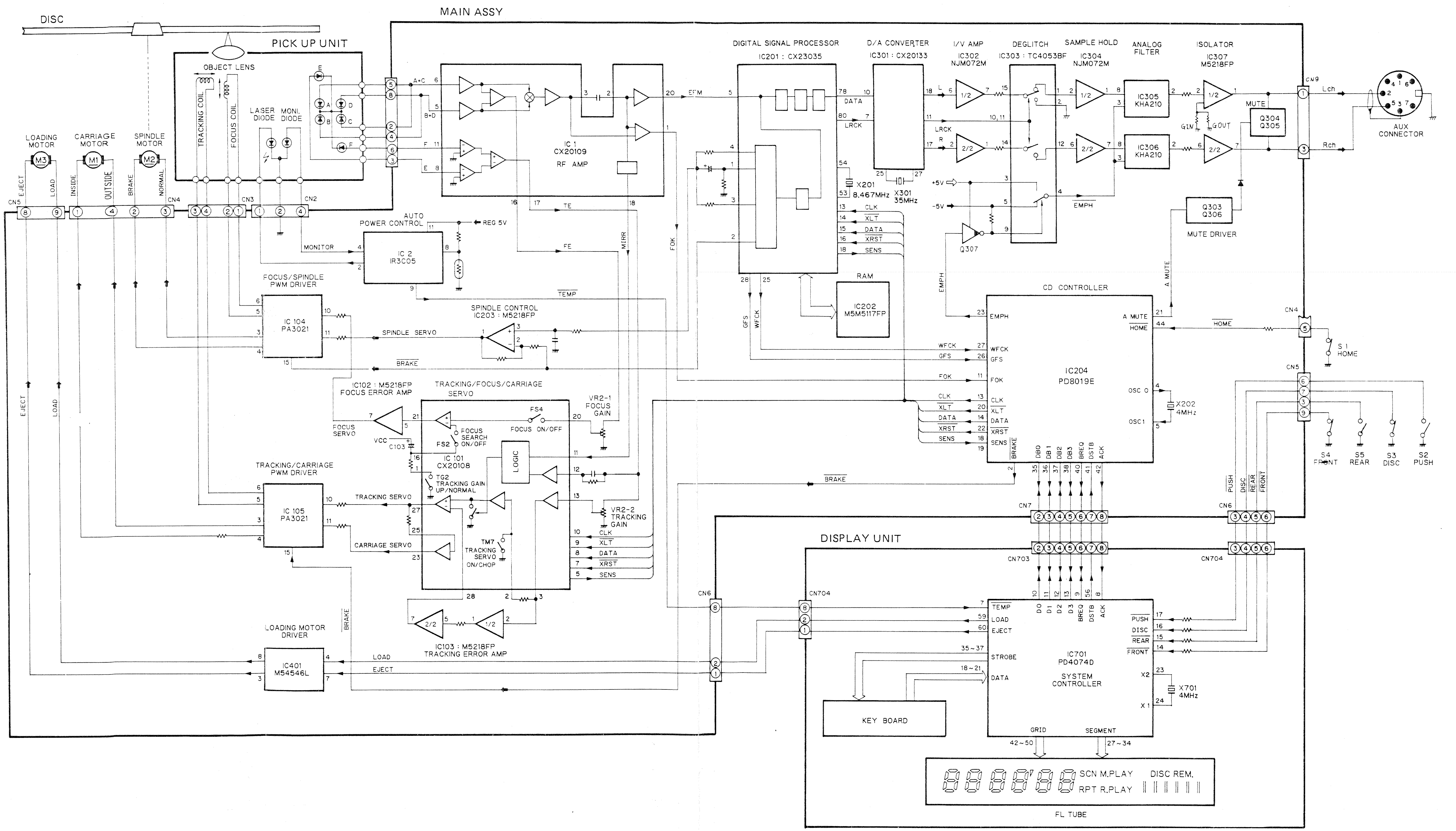

DISC
MAIN ASSY
PICK UP UNIT
OBJECT LENS
TRACKING COIL
FOCUS COIL
LASER DIODE
MONI. DIODE
LOADING MOTOR
CARRIAGE MOTOR
SPINDLE MOTOR
M3
M1
M2
EJECT
LOAD
INSIDE
OUTSIDE
BRAKE
NORMAL
CN5
CN4
CN3
CN2
A+C
B+D
IC 1
CX20109
RF AMP
TE
FE
MIRR
FOK
EFM
AUTO POWER CONTROL
REG 5V
MONITOR
IC 2
IR3C05
TEMP
FOCUS/SPINDLE PWM DRIVER
IC 104
PA3021
SPINDLE CONTROL
IC203 : M5218FP
SPINDLE SERVO
BRAKE
IC102 : M5218FP
FOCUS ERROR AMP
TRACKING/FOCUS/CARRIAGE SERVO
VR2-1 FOCUS GAIN
FS4
FOCUS ON/OFF
FOCUS SERVO
VCC
C103
FS2
FOCUS SEARCH ON/OFF
IC 101
CX20108
LOGIC
TG2
TRACKING GAIN UP/NORMAL
VR2-2 TRACKING GAIN
TM7
TRACKING SERVO ON/CHOP
TRACKING/CARRIAGE PWM DRIVER
IC 105
PA3021
TRACKING SERVO
CARRIAGE SERVO
CLK
XLT
DATA
XRST
SENS
IC103 : M5218FP
TRACKING ERROR AMP
LOADING MOTOR DRIVER
IC401
M54546L
LOAD
EJECT
DIGITAL SIGNAL PROCESSOR
IC201 : CX23035
DATA
LRCK
X201
8.467MHz
X301
35MHz
GFS
WFCK
RAM
IC202
M5M5117FP
D/A CONVERTER
IC301 : CX20133
I/V AMP
IC302
NJM072M
DEGLITCH
IC303 : TC4053BF
SAMPLE HOLD
IC304
NJM072M
ANALOG FILTER
IC305
KHA210
IC306
KHA210
ISOLATOR
IC307
M5218FP
MUTE
Q304
Q305
GIN
GOUT
Q303
Q306
MUTE DRIVER
Q307
+5V
-5V
EMPH
A MUTE
CN9
Lch
Rch
AUX CONNECTOR
CD CONTROLLER
IC204
PD8019E
HOME
WFCK
GFS
FOK
OSC O
OSC 1
X202
4MHz
DB0
DB1
DB2
DB3
BREQ
DSTB
ACK
CN4
S 1 HOME
CN5
S4 FRONT
S5 REAR
S3 DISC
S2 PUSH
PUSH
DISC
REAR
FRONT
CN7
CN6
DISPLAY UNIT
CN703
CN704
CN6
IC701
PD4074D
SYSTEM CONTROLLER
TEMP
LOAD
EJECT
STROBE
DATA
D0
D1
D2
D3
X2
X1
X701
4MHz
KEY BOARD
GRID
SEGMENT
42~50
27~34
35~37
18~21
SCN M.PLAY
DISC REM.
RPT R.PLAY
FL TUBE

Fig. 25

- +B Block Diagram

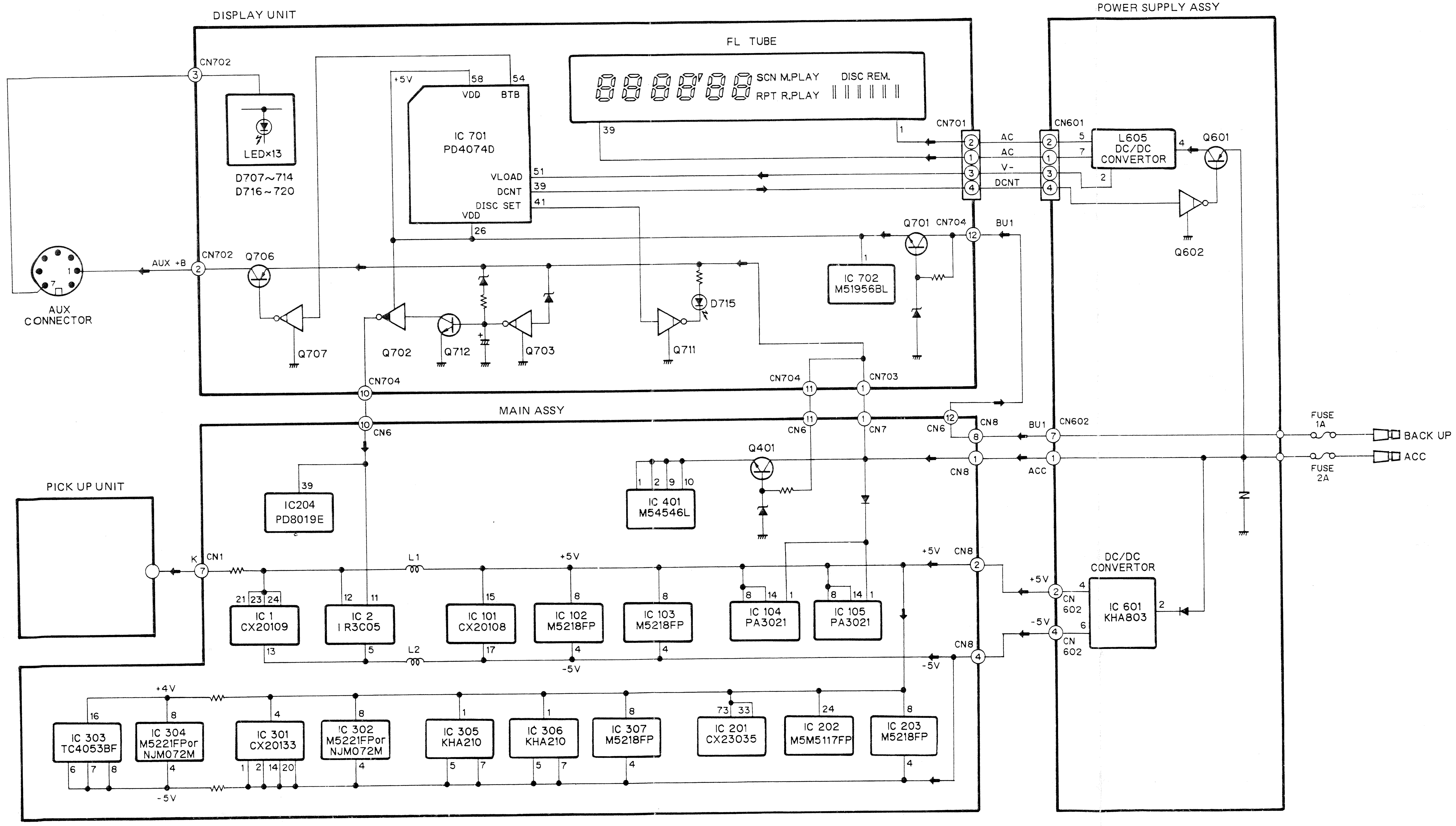
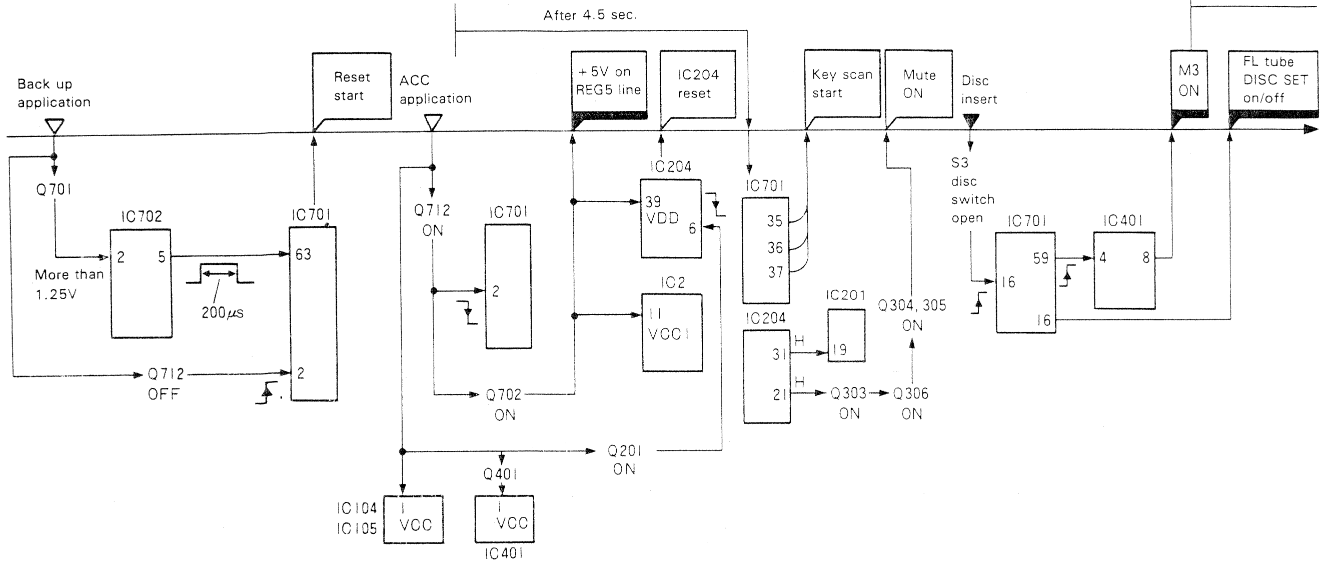
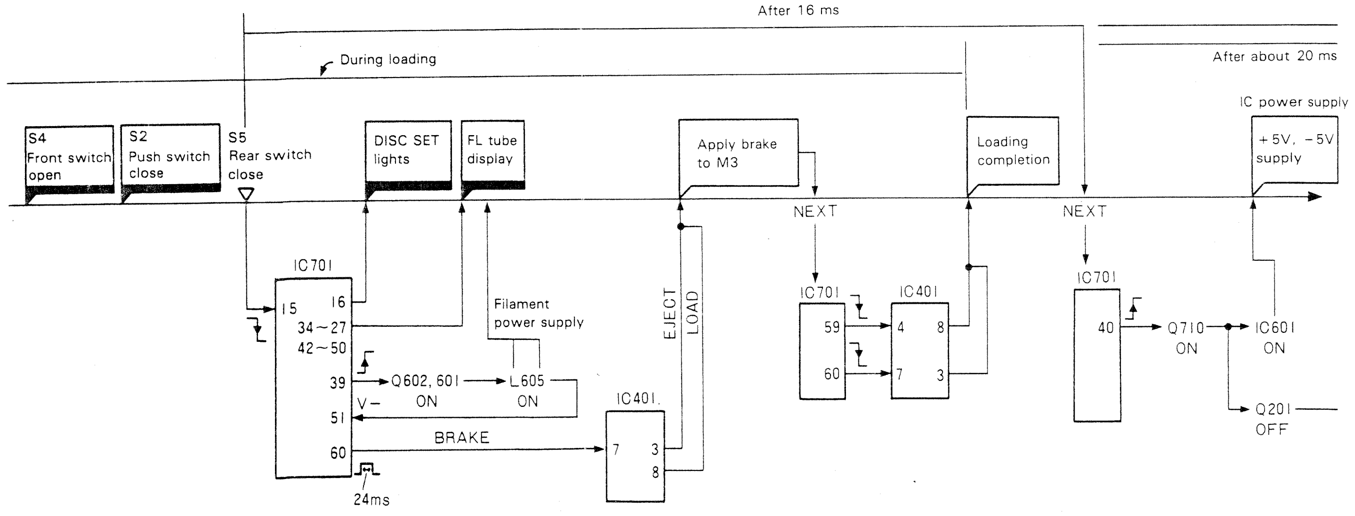
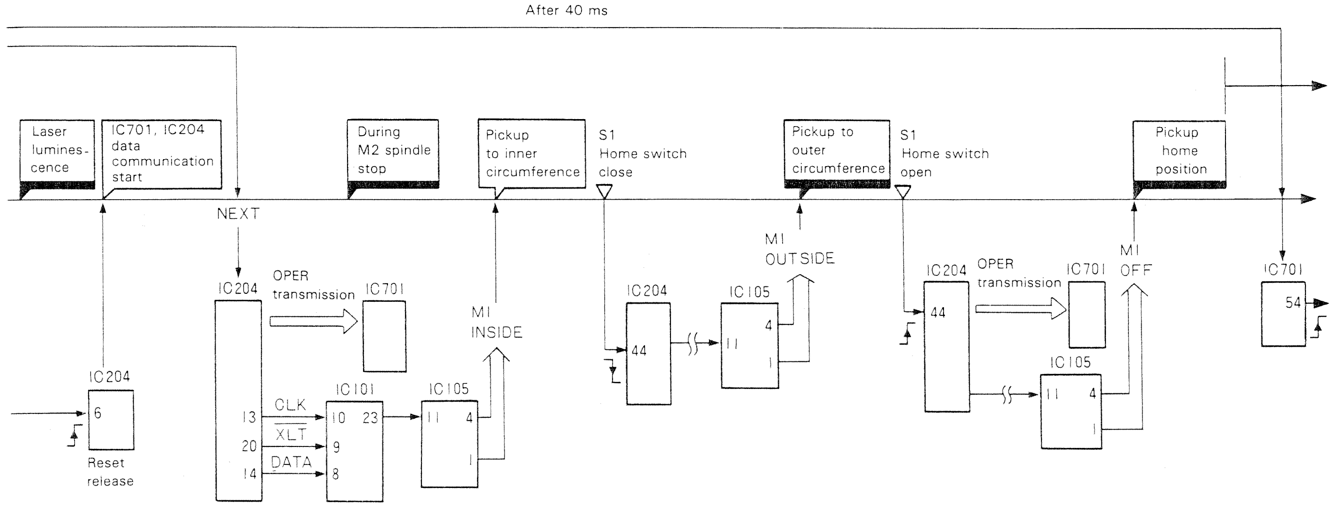

DISPLAY UNIT
POWER SUPPLY ASSY
FL TUBE
SCN M.PLAY
DISC REM.
RPT R.PLAY
39
1
CN702
3
LED×13
D707~714
D716~720
+5V
58
54
VDD
BTB
IC 701
PD4074D
VLOAD
DCNT
DISC SET
VDD
51
39
41
26
CN701
2
1
3
4
AC
AC
V-
DCNT
CN601
5
7
L605
DC/DC
CONVERTOR
4
2
Q601
Q602
Q701
CN704
12
BU1
IC 702
M51956BL
AUX +B
CN702
2
Q706
AUX
CONNECTOR
D715
Q707
Q702
Q712
Q703
Q711
CN704
10
CN704
11
CN703
1
MAIN ASSY
CN6
10
11
CN7
CN6
12
CN8
8
BU1
CN602
7
FUSE
1A
BACK UP
ACC
FUSE
2A
CN8
1
ACC
Q401
IC 401
M54546L
1
2
9
10
39
IC204
PD8019E
PICK UP UNIT
K
CN1
7
L1
+5V
+5V
CN8
2
21
23
24
IC 1
CX20109
12
11
IC 2
I R3C05
15
IC 101
CX20108
8
IC 102
M5218FP
8
IC 103
M5218FP
8
14
1
IC 104
PA3021
8
14
1
IC 105
PA3021
DC/DC
CONVERTOR
+5V
CN
602
4
IC 601
KHA803
6
-5V
CN
602
2
13
5
L2
17
4
-5V
4
CN8
4
-5V
+4V
16
IC 303
TC4053BF
6
7
8
8
IC 304
M5221FPor
NJM072M
4
-5V
4
IC 301
CX20133
1
2
14
20
8
IC 302
M5221FPor
NJM072M
4
1
IC 305
KHA210
5
7
1
IC 306
KHA210
5
7
8
IC 307
M5218FP
4
73
33
IC 201
CX23035
24
IC 202
M5M5117FP
8
IC 203
M5218FP
4

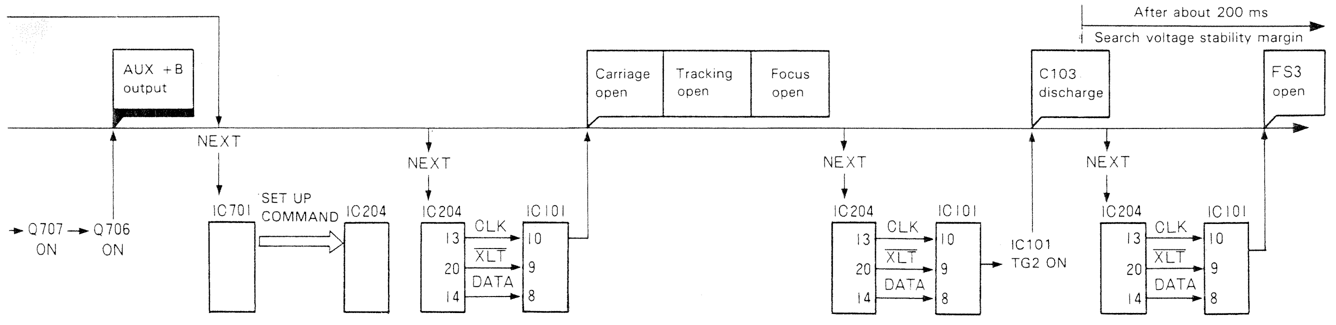
Fig. 26

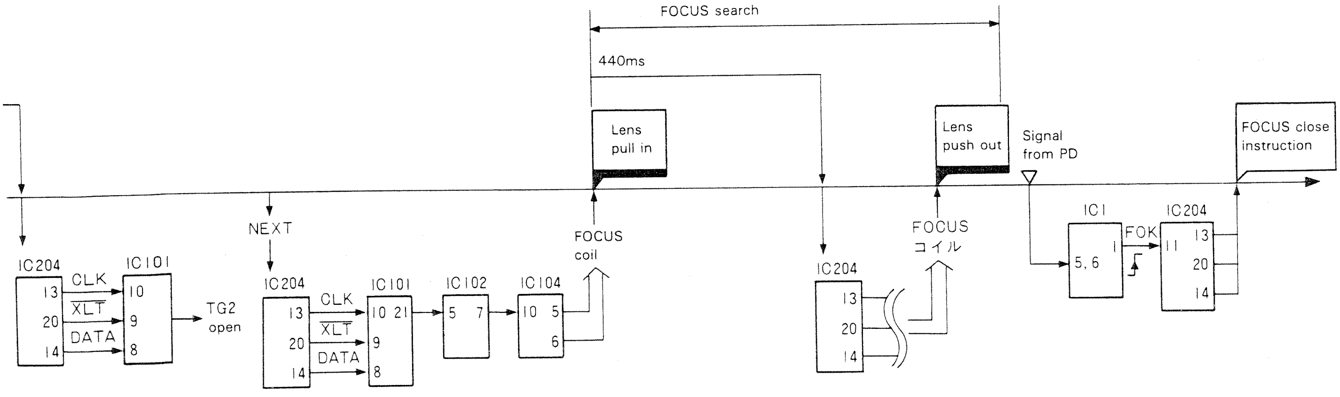
• Power Supply Application ➡ PLAY

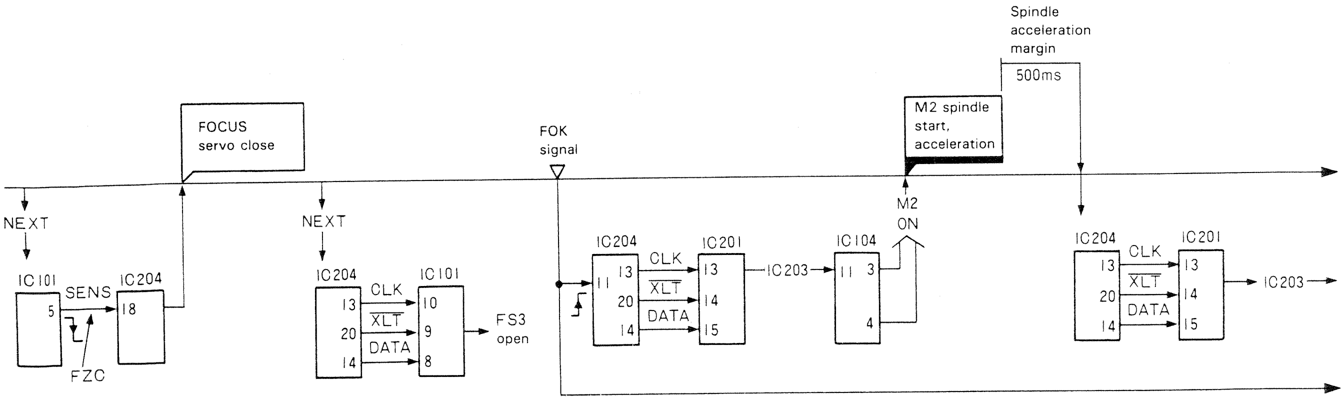

After 4.5 sec.
Back up application
Reset start
ACC application
+5V on REG5 line
IC204 reset
Key scan start
Mute ON
Disc insert
M3 ON
FL tube DISC SET on/off
Q701
IC702
2
5
More than 1.25V
200µs
IC701
63
2
Q712 OFF
Q712 ON
IC701
2
Q702 ON
IC204
39 VDD 6
IC2
11 VCC1
IC701
35
36
37
IC204
31
21
H
H
IC201
19
Q304, 305 ON
Q303 → Q306
ON ON
S3 disc switch open
IC701
59
16
16
IC401
4
8
Q201 ON
Q401
IC104
IC105
1 VCC
VCC
IC401

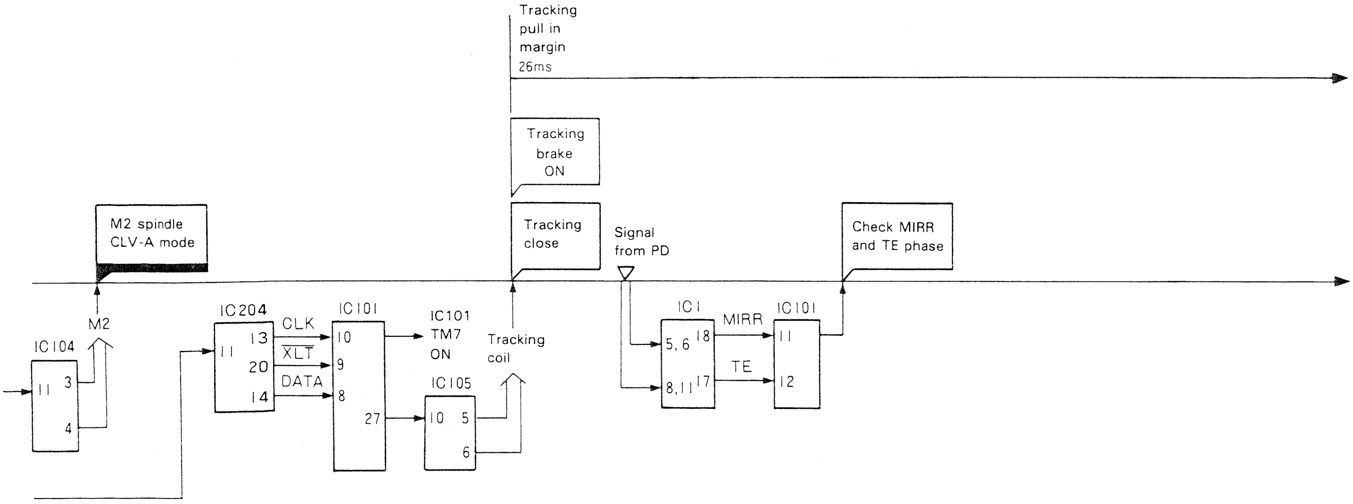

After 16 ms
During loading
After about 20 ms
IC power supply
S4 Front switch open
S2 Push switch close
S5 Rear switch close
DISC SET lights
FL tube display
Apply brake to M3
Loading completion
+5V, −5V supply
IC701
15
16
34−27
42−50
39
51
60
24ms
Q602, 601 ON
L605 ON
V−
Filament power supply
BRAKE
IC401
7
3
8
EJECT
LOAD
NEXT
IC701
59
60
IC401
4
8
7
3
NEXT
IC701
40
Q710 ON
IC601 ON
Q201 OFF

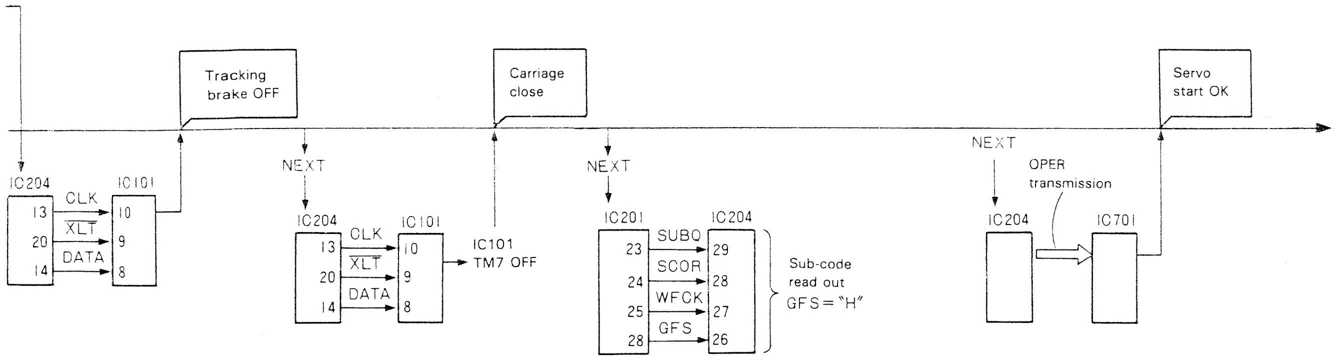

After 40 ms
Laser luminescence
IC701, IC204 data communication start
During M2 spindle stop
Pickup to inner circumference
S1 Home switch close
Pickup to outer circumference
S1 Home switch open
Pickup home position
NEXT
IC204
6
Reset release
IC204
13
20
14
OPER transmission
IC701
CLK
XLT
DATA
IC101
10
23
9
8
IC105
11
4
1
M1 INSIDE
IC204
44
IC105
11
4
1
M1 OUTSIDE
IC204
44
OPER transmission
IC701
IC105
11
4
1
M1 OFF
IC701
54

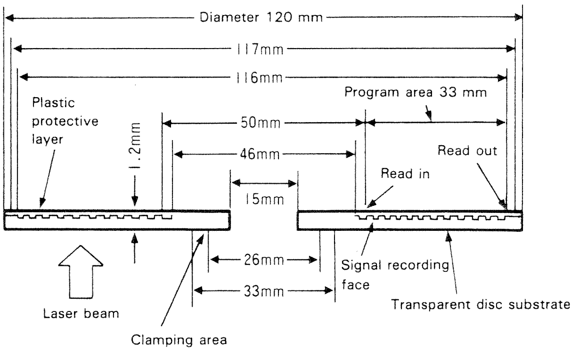

After about 200 ms
Search voltage stability margin
AUX +B output
Q707 → Q706
ON ON
NEXT
IC701
SET UP COMMAND
IC204
Carriage open
Tracking open
Focus open
NEXT
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
NEXT
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
C103 discharge
IC101 TG2 ON
NEXT
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
FS3 open


FOCUS search
440ms
Lens pull in
Lens push out
Signal from PD
FOCUS close instruction
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
TG2 open
NEXT
IC204
13
20
14
CLK
XLT
DATA
IC101
10 21
9
8
IC102
5 7
IC104
10 5
6
FOCUS coil
IC204
13
20
14
FOCUS コイル
IC1
5, 6
1
FOK
IC204
11
13
20
14


Spindle acceleration margin
500ms
FOCUS servo close
FOK signal
M2 spindle start, acceleration
NEXT
IC101
5
SENS
FZC
IC204
18
NEXT
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
FS3 open
IC204
11
13
20
14
CLK
XLT
DATA
IC201
13
14
15
IC203
IC104
11 3
4
M2 ON
IC204
13
20
14
CLK
XLT
DATA
IC201
13
14
15
IC203


Tracking
pull in
margin
26ms
Tracking
brake
ON
M2 spindle
CLV-A mode
Tracking
close
Signal
from PD
Check MIRR
and TE phase
IC104
11
3
4
M2
IC204
11
13
20
14
CLK
XLT
DATA
IC101
10
9
8
27
IC101
TM7
ON
IC105
10
5
6
Tracking
coil
IC1
5, 6
8, 11
18
17
MIRR
TE
IC101
11
12


Tracking
brake OFF
Carriage
close
Servo
start OK
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
NEXT
IC204
13
20
14
CLK
XLT
DATA
IC101
10
9
8
IC101
TM7 OFF
NEXT
IC201
23
24
25
28
SUBQ
SCOR
WFCK
GFS
IC204
29
28
27
26
Sub-code
read out
GFS = "H"
NEXT
OPER
transmission
IC204
IC701


Diameter 120 mm
117mm
116mm
Program area 33 mm
Plastic
protective
layer
1.2mm
50mm
46mm
Read out
Read in
15mm
26mm
33mm
Signal recording
face
Transparent disc substrate
Laser beam
Clamping area

→ TOC read
Since all servo system rise is performed at the HOME position, the pick up is located in the disc program area where a signal is readable. Then the sub-code absolute address is read and the number of tracks up to recorded TOC (read-in part)are computed by the pickup shift distance to start TOC read.

*TOC (Table of Contents)
Data concerning the music No. and musical performance time period which is recorded at the disc inner circumference.

→ Since the TOC is recorded at IC701, the TOC is transferred from IC204 to IC701.

→ Program search → Play

• System Outline

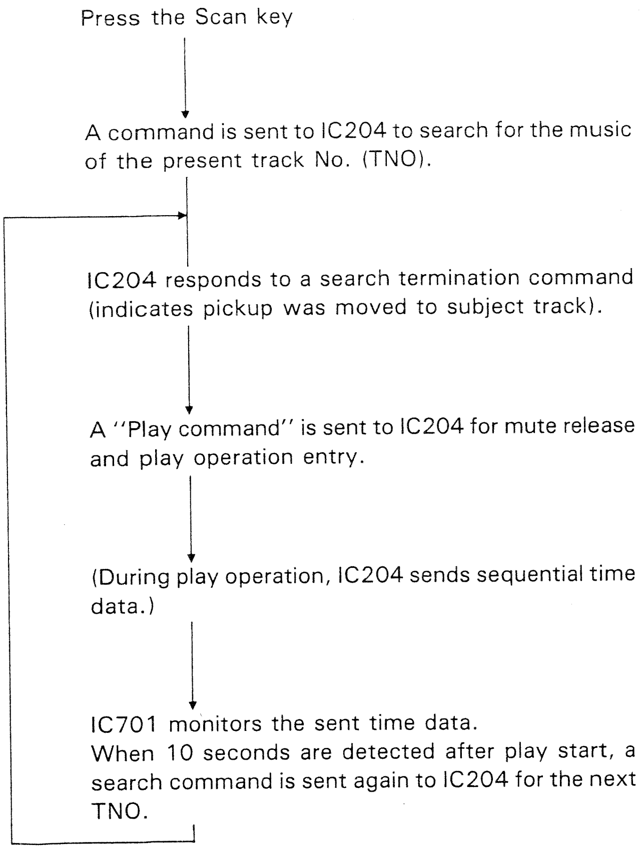
Unit control is performed by a system controller (IC701: PD4074D).

The system controller in the display unit controls the CD controller (IC204: PD8019E) by using a communication line. The CD controller performs all CD player operations such as focus servo, tracking servo, basic play operations, and sequence control for the signal processing LSI group (CX20108, CX23035, etc.) related to search operations.

Normally the system controller provides CD player system external interface as indicated below.

- Key matrix sense and beep control
- Display control
- Loading system mechanism control
- Power supply line monitoring and control such as for ACC, back up, etc.
- High temperature sense and protective operation control
- CENTRATE, LC II interface management

Also, the system controller takes care of CD player functions (search, random play, scan, etc.). For example, in regard to the scan function,



Press the Scan key

A command is sent to IC204 to search for the music of the present track No. (TNO).

IC204 responds to a search termination command (indicates pickup was moved to subject track).

A "Play command" is sent to IC204 for mute release and play operation entry.

(During play operation, IC204 sends sequential time data.)

IC701 monitors the sent time data.
When 10 seconds are detected after play start, a search command is sent again to IC204 for the next TNO.

IC701 provides sequential control for IC204 that only performs basic operations as mentioned above. Therefore, this unit is roughly divided into:

- IC701 that controls the entire CD player.
- IC204 that controls the pickup system servo.

• Communication Bus

The following provides an explanation of the dedicated communication bus that facilitates data exchange between the system controller (IC701) and the CD controller (IC204). This communication bus consists of 7 lines which are 4 data lines (D0-D3), ACK, STB handshake lines and a bus request (BREQ) line. Data exchange is parallel 4-bit bi directional. ACK, STB handshaking is provided so that data transfer is confirmed. Also, the BREQ line is used to control the timing for data string (play command, search command, etc.) output. Generally, IC204 output is "L" periodic with a 26 ms cycle (Fig. 27).

Ordinary communication processing chart (commands sent from IC701 and responses received from IC204)

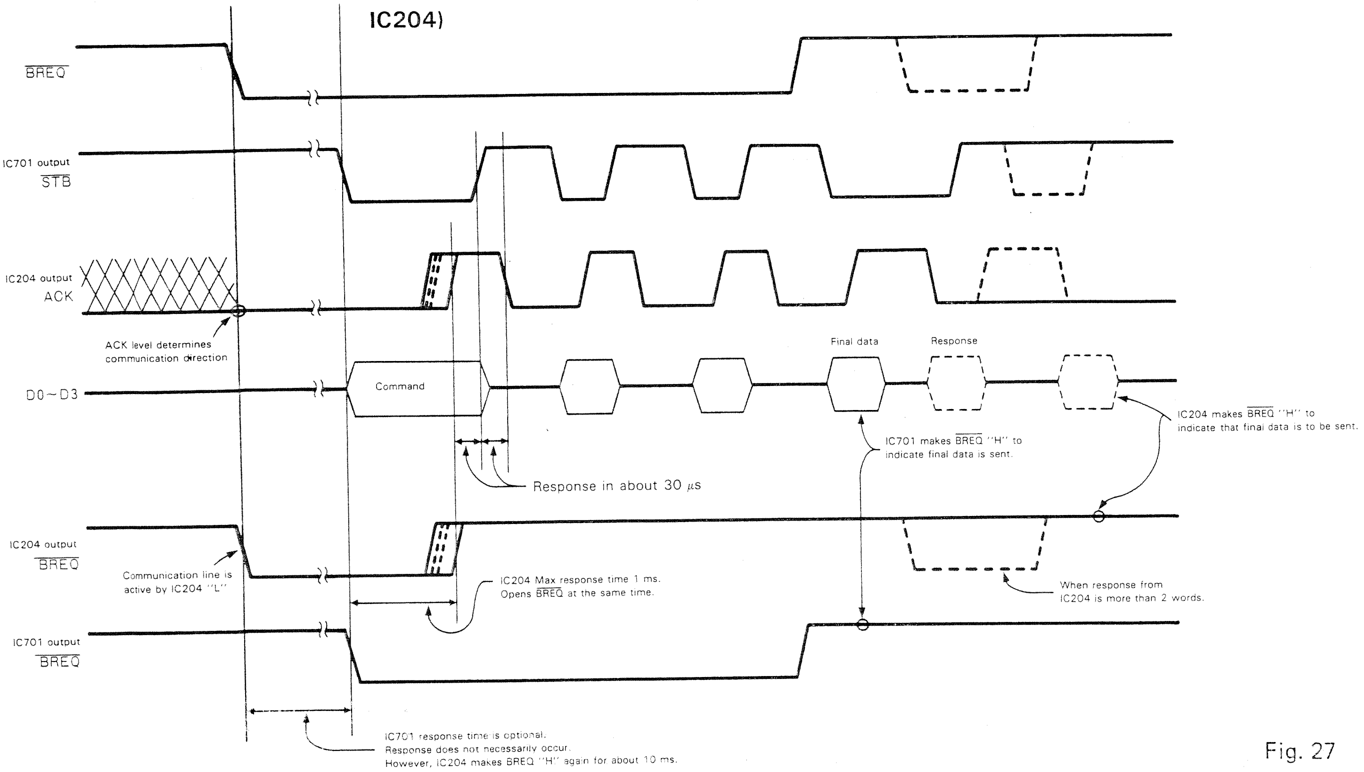

$\overline{BREQ}$
IC701 output $\overline{STB}$
IC204 output ACK
ACK level determines communication direction
D0~D3
Command
Final data
Response
IC204 makes $\overline{BREQ}$ ''H'' to indicate that final data is to be sent.
IC701 makes $\overline{BREQ}$ ''H'' to indicate final data is sent.
Response in about 30 μs
IC204 output $\overline{BREQ}$
Communication line is active by IC204 ''L''
IC204 Max response time 1 ms. Opens $\overline{BREQ}$ at the same time.
When response from IC204 is more than 2 words.
IC701 output $\overline{BREQ}$
IC701 response time is optional. Response does not necessarily occur. However, IC204 makes BREQ ''H'' again for about 10 ms.

Fig. 27

1) Data format

Data is sent by DO-D3 data lines. The instructions and request data sent by the system controller are called commands and response data sent by the CD controller is called a response.

Command, response code allocation

Command	Code				Response	Contents
	D3	D2	D1	D0		
?	0	0	0	0	?	Resend request
. . .	0	0	0	1	. . .	
. . .	0	0	1	0	NACK	Not acknowledged
. . .	0	0	1	1	. . .	
STAT	0	1	0	0	STAT	Mechanism status
. . .	0	1	0	1	OPER	Operation satus change. When operation is normal.
. . .	0	1	1	0	INT	Operation status change. When operation is abnormal.
PARAM	0	1	1	1	ACK	Parameter set
STOP	1	0	0	0	ACK	Stop operation instruction
SET UP	1	0	0	1	ACK	Set up operation instruction
PLAY	1	0	1	0	ACK	Play operation instruction
SEARCH	1	0	1	1	ACK	Search operation instruction
FF	1	1	0	0	ACK	High speed forward operation instruction
REV	1	1	0	1	ACK	High speed reverse operation instruction
. . .	1	1	1	0	. . .	
. . .	1	1	1	1	. . .	

ACK: Response signal that indicates acceptance.

Represenative examples of each command and response format are provided as follows. (Also, communication can be performed with other formats.)

[Operation instruction command]([Operation parameter]) ↔ [Command response] .... [Asynchronous response] [Operation status data]

This format is used when the system controller provides a certain operation instruction for the CD controller. When the CD controller receives a command, it immediately returns a command response depending on the controller status, and starts mechanism operation at the same time. Although communication is suspended once, the CD controller sends an asynchronous response to the system controller depending on a change in the mechanism operation status, then it sends operation change data. Since operation change data is sent for an operation instruction command, that for an operation instruction command just sent is sent until a new operation instruction command is sent. The operation parameter that suceeds the operation command depends on a different operation command. When it is omitted, operation is prescribed by a previously determined default value or a value set by a parameter set command.

[Status request command] ⟷ [Synchronous response] [Mechanism status data]

When the system controller sends a status request command, the CD controller provides a direct synchronous response instead of a command response and a command response is omitted. In this case, mechanism status data is sent after a synchronous response.

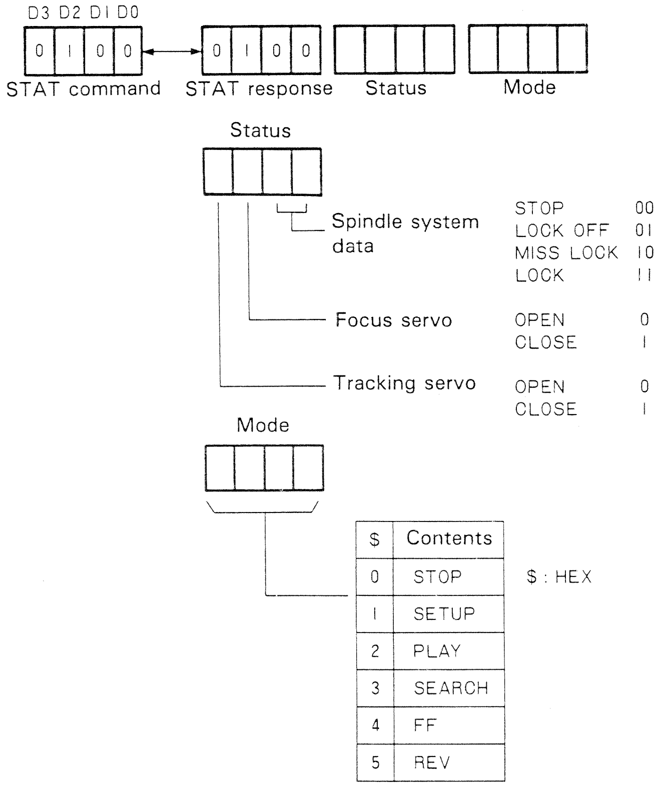
[Parameter set command][Parameter data] ←→ [Command response]

Format when CD controller parameter is set.

When this command is received, the CD controller returns "ACK" unconditionally as a command response, and at the same time rewrites the internal CD controller parameter.

- **STAT command**

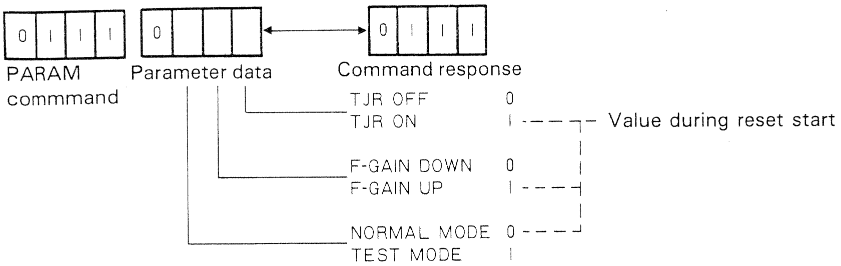
STAT is a command sent by the system controller as a status send request. The CD controller responds with a synchronous STAT response and sends the following data.


D3 D2 D1 D0
0 1 0 0
0 1 0 0
STAT command
STAT response
Status
Mode
Status
Spindle system data
STOP 00
LOCK OFF 01
MISS LOCK 10
LOCK 11
Focus servo
OPEN 0
CLOSE 1
Tracking servo
OPEN 0
CLOSE 1
Mode
$: HEX

$	Contents
0	STOP
1	SETUP
2	PLAY
3	SEARCH
4	FF
5	REV

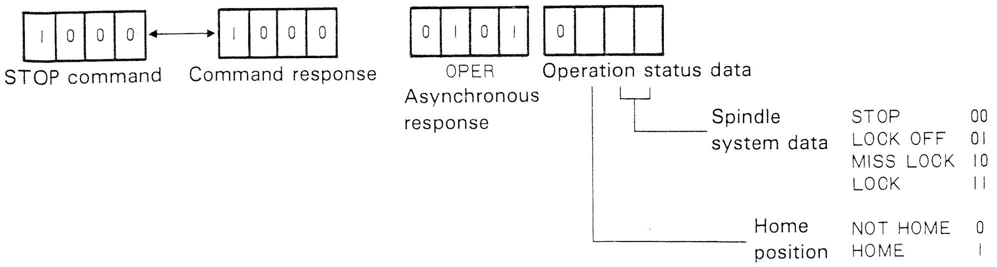
- **PARAM command**

PARAM, a parameter set comand, sets the following data.


0 1 1 1
0
0 1 1 1
PARAM commmand
Parameter data
Command response
TJR OFF 0
TJR ON 1
Value during reset start
F-GAIN DOWN 0
F-GAIN UP 1
NORMAL MODE 0
TEST MODE 1

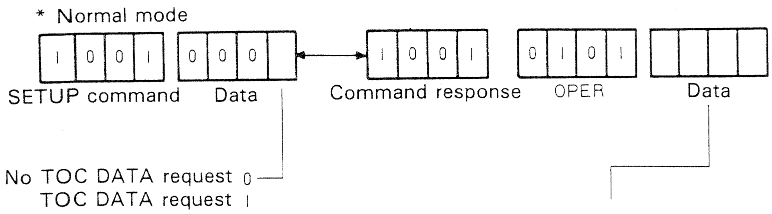
※ TJR: Tracking Jump Return

- **STOP command**

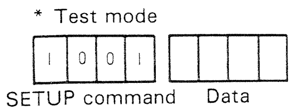

1 0 0 0
1 0 0 0
0 1 0 1
0
STOP command
Command response
OPER Asynchronous response
Operation status data
Spindle system data
STOP 00
LOCK OFF 01
MISS LOCK 10
LOCK 11
Home position
NOT HOME 0
HOME 1

- **SETUP command**

The SETUP command format depends on the mode set by PARAM.


* Normal mode
1 0 0 1
0 0 0
1 0 0 1
0 1 0 1
SETUP command
Data
Command response
OPER
Data
No TOC DATA request 0
TOC DATA request 1

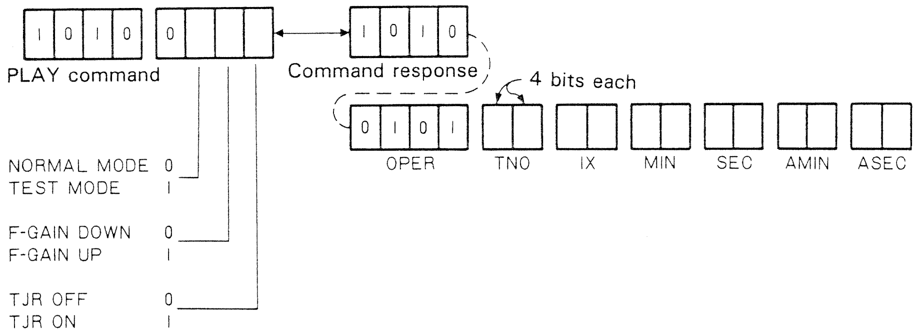
Data	Semantics
0	Servo start OK
Status	TOC data send mode (sent with a 26 ms cycle) ☐☐ ☐☐ ☐☐ 6 ward POINT PMIN PSEC


* Test mode
1 0 0 1
SETUP command
Data

Data($)	Operation	Data ($)	Operation
2	Focus open	9	Carriage FWD
3	Focus close	A	Carriage REV
4	Tracking open	C	PLAY
5	Tracking close	D	FWD jump
6	All servos on	E	REV jump
8	Carriage off		

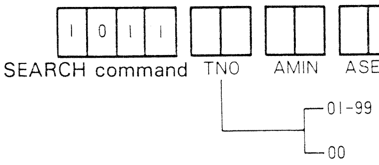
*As a response format, one equivalent to the STAT response is sent when servo operation has been terminated.

- **PLAY command**


1 0 1 0
0
1 0 1 0
PLAY command
Command response
4 bits each
0 1 0 1
OPER
TNO
IX
MIN
SEC
AMIN
ASEC
NORMAL MODE 0
TEST MODE 1
F-GAIN DOWN 0
F-GAIN UP 1
TJR OFF 0
TJR ON 1

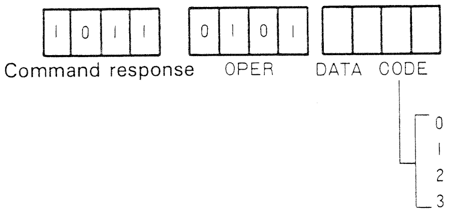
As a response, 12 woad sub-code data is sent continuously to OPER. Also, the response is sent every second because it is sent only with a second change. However, it is sent immediately when the parameter is changed, or in other words when the music or index is changed.

- **SEARCH command**


1 0 1 1
SEARCH command
TNO
AMIN
ASEC
01-99
00

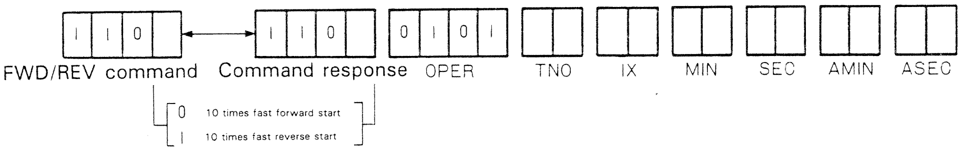
01-99 Ordinary track No. search. AMIN, ASEC indicate the TOC content.

00 Absolute address search up to the target shown by AMIN, ASEC.


1 0 1 1
0 1 0 1
Command response
OPER
DATA CODE
TNO
AMIN
ASEC
0
1
2
3

0 A target is reached
1 Search is terminated around the target area with time out.
2 Requested TNO does not exist on the disc.
3 Requested TNO does not exist on the disc.

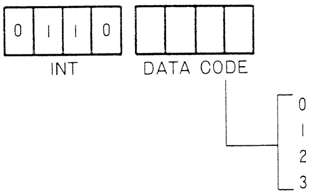
- **FWD/REV command**


1 1 0
1 1 0
0 1 0 1
FWD/REV command
Command response
OPER
TNO
IX
MIN
SEC
AMIN
ASEC
0 10 times fast forward start
1 10 times fast reverse start

A response is sent after OPER when it changes every 26ms. When a parameter (TNO, IX, etc.) change occurs, it is sent immediately.

- **INT response**

An INT response can be accepted with any system controller operation status as an asynchronous response to notify the system controller that the CD controller has entered the STOP mode.


0 1 1 0
INT
DATA CODE
0
1
2
3

0 Time out during carriage operation.
1 Focus cannot be closed.
2 Spindle cannot be locked.
3 Sub-code cannot be read.

• CD Controller (IC204)

The servo IC CX20108 (IC101) and digital processing IC CX23035 (IC201) are controlled by DATA, CLK, $\overline{\text{XLT}}$, $\overline{\text{XRST}}$ outputted by the CD controller PD8019E (IC204) in which a SENS signal that matches the data content is outputted to IC204. The timing for DATA, CLK, $\overline{\text{XLT}}$ is shown in Fig. 28.

DATA transfer is by 8 bit serial data. This data is latched by the $\overline{\text{XLT}}$ signal which executes the instruction. The $\overline{\text{XRST}}$ signal clears the IC shift register during ACC ON.

The content of data to IC101, 201 is as shown in the table below.

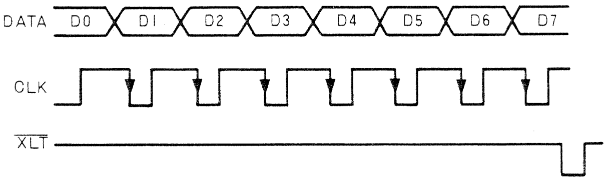


Fig. 28

Communicate to	Kinds (command)	Address		Task			SENS terminal
		D7 – D4	D3	D2	D1	D0	
IC101 CX20108	Focus control	0 0 0 0	FS4 Focus on	FS3 F gain down	FS2 F search ON	FS1 F search UP	FZC
	Tracking control	0 0 0 1	Anti shock	Brake on	TG 2 Gain set	TG 1	AS
	Tracking mode	0 0 1 0	Tracking mode		Sled mode		TZC
IC201 CX23035	Sync protection, attenuator control	1 0 1 0	GSEM	GSEL	WSEL	ATTM	Z
	Counter set, lower 4 bits	1 0 1 1	Tc3	Tc2	Tc1	Tc0	$\overline{\text{COMPLETE}}$
	Counter set, upper 4 bits	1 1 0 0	Tc7	Tc6	Tc5	Tc4	$\overline{\text{COUNT}}$
	CLV control	1 1 0 1	DiV	TB	TP	GAIN	Z
	CLV mode	1 1 1 0	CLV mode				$\overline{\text{PW} \geq 64}$

FZC: Focus zero cross, AS: Anti shock, TZC: Tracking zero cross, Z : High impedance

1) Focus control command

Provides the focus search voltage in order to search for the zero cross point by moving the lens up and down. Outputs the FZC signal (H to L) from the IC101 SENS terminal at the zero cross point to fetch the focus lock timing.

2) Tracking control command

This command controls the tracking gain and brake circuit.

The tracking gain is increased when TG1 = TG2 = 1.

TG1 changes the high pass compensation time constant by turning the phase compensation selection switch on. TG2 switches the high pass gain. When a large impact is detected in the anti shock circuit, a sound skip is prevented by increasing the tracking gain. Also, during track jump, spot return is prevented by increasing the gain to realize a track jump.

The anti shock circuit consists of a window comparator (in IC101) for checking the tracking error signal magnitude by input from IC101 terminal (19). When the entry of an error signal larger than the window occurs, player mechanical impact is detected and the servo gain is increased to keep the beam on the track. The anti-shock circuit functions when D3 = 1. During this command, SENS output expresses AS (Anti Shock). If tracking error input exceeds the window size (large impact), AS = 1 occurs.

If 100 track jump or 10 track jump occurs during access, the brake circuit turns the tracking servo circuit on and off to stop the beam at a desired position quickly. The brake functions when D2 = 1.

3) Tracking mode command

This command is used to cause a jump pulse and fast forward pulse during access, and tracking servo and carriage servo ON/OFF.

Operation	Tracking mode		Operation	Carriage mode	
	D3	D2		D1	D0
Servo off	0	0	Servo off	0	0
Servo on	0	1	Servo on	0	1
FWD jump	1	0	Fast FWD	1	0
REV jump	1	1	Fast REV	1	1

Command Code

4) Sync protection, attenuator control command

D3	D2		D1		D0		
GSEM	GSEL	Number of interpolated frames	WSEL	Window width (clock)	ATTM	MUTG terminal (pin 19)	Attenuation (dB)
0	0	2	0	±3	0	0	0
0	1	4	1	±7	0	1	−∞
1	0	8			1	0	−12
1	1	13			1	1	−12

Command Code

- **Sync protection (D3–D1)**

Although a data pattern (3T–11T) the same as a frame sync signal (24T) does not exist during recording, sometimes the same pattern is detected in data due to the influence of dropout and jitter. Also, on the other hand, since an original frame sync signal is not detected sometimes, protection and interpolation as well as detection are necessary.

Only the edge of the EFM signal latched by PLCK is input as "1" and the other part is input to the 23 bit shift register after conversion to "0" to detect a frame sync signal.

A window is provided to protect a frame sync signal, and the same pattern outside the window is eliminated. When a frame sync signal does not exist in the window, interpolation is performed by a signal generated by the 588 octal counter (4.3218 MHz / 588 = 7.35 kHz). A 4 bit counter is provided that counts the number of interpolated frames. When this value reaches the number of frames selected by GSEL, GSEM, the window is ignored and the 4 bit counter is reset when the next frame sync signal occurs during which GTOP (pin 27) becomes "H". Also, the GFS terminal (pin 28) becomes "H" while the frame sync signal generated by the 588 octal counter for interpolation is synchronized with the frame sync signal from the disc.

The write request signal (WREQ) and timing such as the write frame clock (WFCK) are generated based on the protected and iterpolated frame sync signal.

- **Attenuator (D0)**

A signal appears at the MUTG terminal (pin 19) from IC204 (CD controller). Muting or −12dB attenuation is executed by a 2 bit signal.

5) Counter set (lower bit, upper 4 bits)

During access, a track count pulse enters the CNIN terminal (pin 17) from the IC101 CSET terminal (pin 6). This command presets the counter preset value that counts the pulse.

6) CLV control command and CLV mode command

DiV	D3	0	RFCK/4 and WFCK/4	Phase comparison frequency during CLV-P mode
		1	RFCK/8 and WFCK/8	
TB	D2	0	RFCK/32	Bottom hold cycle during CLV-S, CLV-H mode.
		1	RFCK/16	
TP	D1	0	RFCK/4	Peak hold cycle during CLV-S mode.
		1	RFCK/2	
GAIN	D0	0	−12dB	MDP terminal (pin 3) gain during CLV-S, CLV-H mode.
		1	0dB	

CLV Control Command

Mode	D3 – D0	MDP (pin 3)	MDS (pin 4)	FSW (pin 1)	MON (pin 2)
STOP	0 0 0 0	L	Z	L	L
Kick	1 0 0 0	H	Z	L	H
BRAKE	1 0 1 0	L	Z	L	H
CLV-S	1 1 1 0	CLV-S	Z	L	H
CLV-H	1 1 0 0	CLV-H	Z	L	H
CLV-P	1 1 1 1	CLV-P	CLV-P	Z	H
CLV-A	0 1 1 0	CLV-S or CLV-P	Z or CLV-P	L or Z	H

CLV Mode Command

Z: High impedance

These signal are commands that concern the CLV servo. IC204 (CD Controller) selects each CLV mode and sends a command to IC201. IC201 controls spindle motor rotation by the following output. IC201 output is by the MDP terminal that controls the speed and phase synchronization, the MDS terminal that controls speed synchronization, the FSW terminal that performs filter constant switching, and the MON terminal that controls motor on/off. A signal that matches each motor is applied to the spindle control circuit for these terminals.

Usually each control signal outputted from IC201 during play has a modulated pulse width. These signals are applied to the spindle servo circuit (IC203) before application to the PWM driver (IC104) to stabilize operation. The spindle servo circuit consists of a low pass filter with IC203, R206, 207, C205, 204 which converts a signal (pulse) to DC. D201-203 are connected to IC203 output through R210. This circuit is a limiter that prevents excessive motor current flow when a signal becomes abnormally large and is set so that the PWM driver (IC104) output duty range does not become 100%. When IC203 output becomes a large positive value, D202, 203 are turned on and are fixed at +2.5 to 2.7V. When it becomes a large negative value, D201 is turned on and is fixed at −0.5 to −0.7V.

- **STOP mode**

During this mode, the ±5V D/D convertor (IC601) operates and the spindle motor does not rotate (during EJECT, etc.). In regard to each IC201 output, MDP = "L", MDS = "Z", FSW = "L", and MON = "L". IC203 pin 1 output is 0V (SPDD). Also, the MON pin is connected to IC104 pin 15. When this terminal becomes "H", the spindle driver operates. When it is "L", no output occurs (to prevent driver operation by the IC203 offset voltage).

- **KICK mode**
  In this mode, when the spindle motor shifts from a stop status to an operation status, it is forced to operated (forward rotation) so that PLL pull in can be easily performed. Pin 1 (SPDD) of IC203 becomes +4 or +5V which is applied to IC104. Since MON="H", IC104 operates.
- **BRAKE mode**
  In this mode, when motor stop is required during spindle motor forward rotation, a voltage reverse to the forward rotation is applied to the motor to reduce motor rotation rapidly to stop the motor quickly. IC203 pin 1 (SPDD) becomes −3 or −4V. After low speed motor rotation is detected by the signal from IC201 pin 18 SENS terminal, IC204 stops sending the BRAKE command.
- **CLV-S mode (S:SPEED)**
  Rough servo mode used when EFM-PLL circuit lock is released during rotation start, track jump, etc.
- **CLV-H mode**
  Used when the RF signal has an intermittent status such as during high speed search.
- **CLV-P mode**
  Ordinary play mode used during PLL lock.
- **CLV-A mode**
  When the CLV-P mode becomes unstable due to vibration and disc scratches, or when track jump (several tracks) occurs, a switch is made to the CLV-S mode, then an automatic switch is made to the CLV-P mode when disc rotation and PLL are stabilized.

☆ Normal mode

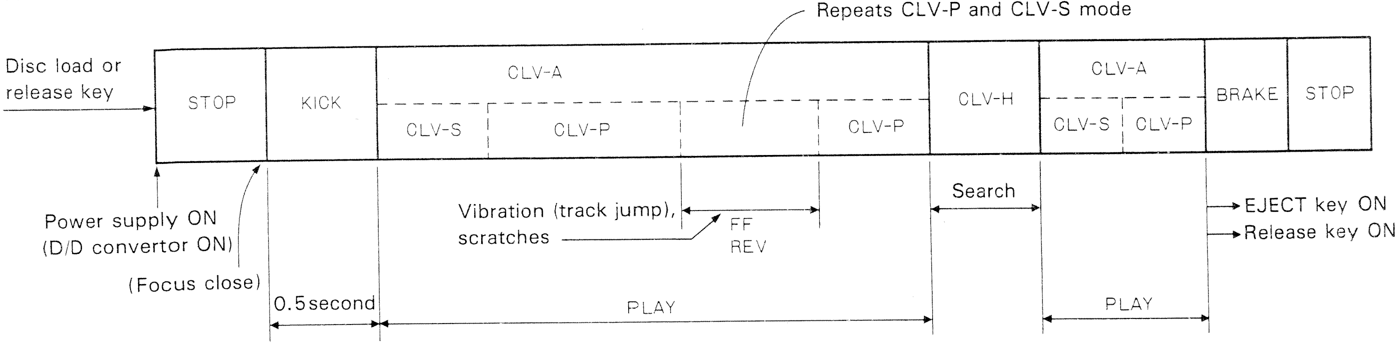

Repeats CLV-P and CLV-S mode
Disc load or release key
STOP
KICK
CLV-A
CLV-S
CLV-P
CLV-P
CLV-H
CLV-A
CLV-S
CLV-P
BRAKE
STOP
Power supply ON
(D/D convertor ON)
(Focus close)
0.5second
Vibration (track jump), scratches
FF
REV
PLAY
Search
PLAY
EJECT key ON
Release key ON

Fig. 29

Fig. 29 Spindle motor control mode selection

☆ Test mode

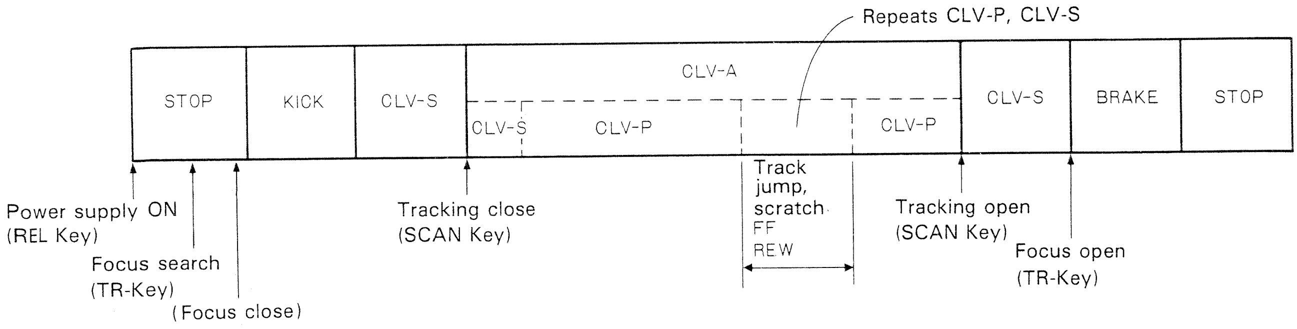

Repeats CLV-P, CLV-S
STOP
KICK
CLV-S
CLV-A
CLV-S
CLV-P
CLV-P
CLV-S
BRAKE
STOP
Power supply ON
(REL Key)
Focus search
(TR-Key)
(Focus close)
Tracking close
(SCAN Key)
Track jump, scratch
FF
REW
Tracking open
(SCAN Key)
Focus open
(TR-Key)

Fig. 30 Spindle motor, control mode switching

• RF Amplifier (IC1:CX20109)

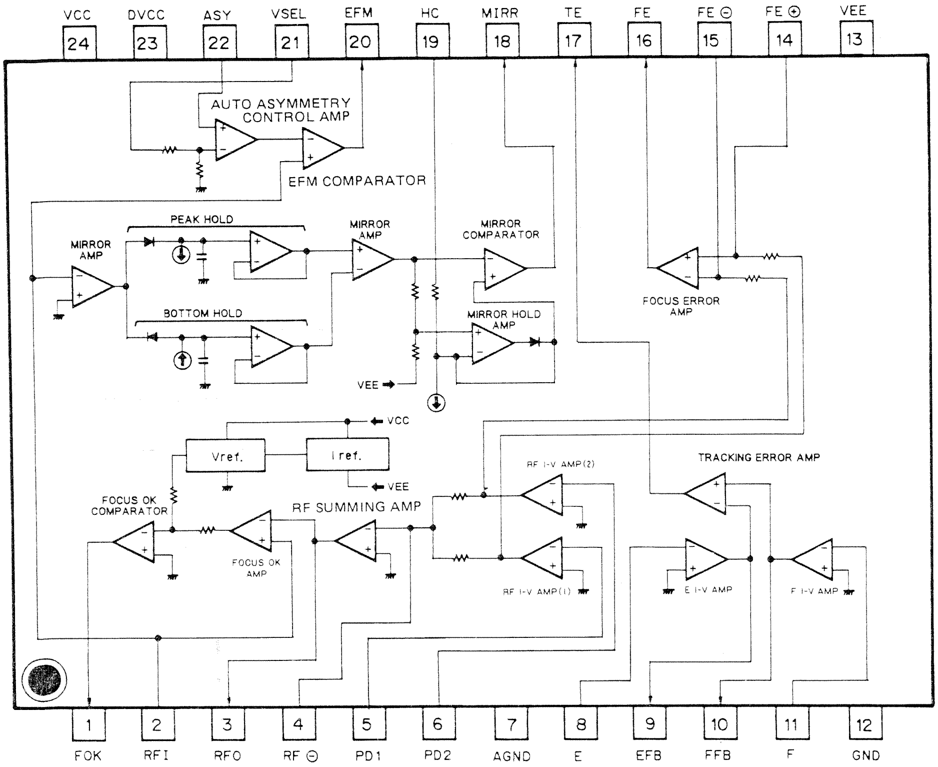

VCC
24
DVCC
23
ASY
22
VSEL
21
EFM
20
HC
19
MIRR
18
TE
17
FE
16
FE ⊖
15
FE ⊕
14
VEE
13
AUTO ASYMMETRY CONTROL AMP
EFM COMPARATOR
PEAK HOLD
MIRROR AMP
MIRROR AMP
MIRROR COMPARATOR
BOTTOM HOLD
MIRROR HOLD AMP
FOCUS ERROR AMP
VEE
VCC
Vref.
I ref.
VEE
FOCUS OK COMPARATOR
RF SUMMING AMP
FOCUS OK AMP
RF I-V AMP(2)
RF I-V AMP(1)
TRACKING ERROR AMP
E I-V AMP
F I-V AMP
1
FOK
2
RFI
3
RFO
4
RF ⊖
5
PD1
6
PD2
7
AGND
8
E
9
EFB
10
FFB
11
F
12
GND

Fig. 31

A circuit that processes the 3 spot pickup output signal and provides a signal to the next step, servo section, demodulator section and servo controller.

1) RF amplifier

Photo diode current input to pin 5, 6 is converted to I-V by the RF I-V amplifier. Also, summation by the RF summing amplifier (A+B+C+D) is output to pin 3.

2) EFM comparator

The RF binary signal input by pin 2 is output to pin 20 as an EFM signal. Since asymmetry that occurs due to uneven disc manufacture cannot be removed just by AC coupling, the 50% probability of a 1, 0 binary EFM signal is used to control the reference voltage of the EFM comparator.

3) Focus error amplifier

The RF I-V amplifier (1) output (A+C) and RF I-V amplifier (2) output (B+D) difference is provided as focus error signal (A+C−B−D) output from pin 16.

4) Tracking error amplifier

Side spot photo diode current input to pin 8, 11 is converted to I-V by the E, F I-V amplifier. Also, the E, F I-V amplifier difference used by the tracking error amplifier is provided as tracking error signal (E−F) output from pin 17.

5) Focus OK circuit

This circuit provides the timing window which turns the focus servo on from a focus search status. In regard to the Focus OK signal (an RF comporator signal), when pin 3 becomes more than 0.4V, pin 1 becomes "H".

6) Mirror circuit

Peak and bottom hold occurs after the pin 2 RFI signal is amplified. A DC reproduced envelope signal is obtained by differential amplification of the peak/bottom hold signals. This signal is compared to a signal in which 2/3 of the peak value is peak held with a large time constant to obtain mirror output. Since the mirror signal becomes "L" on a disc track and "H" between tracks (mirror part), the track difference is detected when the pickup crosses a track. Also, "H" output occurs during defect detection.

• D/A Convertor (IC301) and Integrator (IC302)

IC301 is used to convert 16 bit data to a current signal. IC301 receives each signal (DATA, LRCK, WDCK, BCLK) from IC201 to extract data. Current (I OUT L, R) output occurs from count start until the count becomes zero. In regard to IC302 operation, current output from IC301 charges condensor C310, 311 connected between the (−) input terminal (pin 6, 2) and the output terminal (pin 7, 1). Then voltage that matches this is outputted from IC302 (pin 7, 1) as current conversion to voltage.

When current from IC301 stops, IC302 output holds the voltage.

However, since new data entry is continuous, the hold voltage must return to 0V. Therefore, C310, 311 are discharged by Q301, 302 before new data is extracted. In regard to discharge timing, it is provided as DCL, DCR output by IC301. The output of IC302 varys between 0V and 4V (Fig. 32).

It is as shown in Fig. 32 during non-signal (−∞dB) reproduction. Audio signal operation is with a 2V offset.

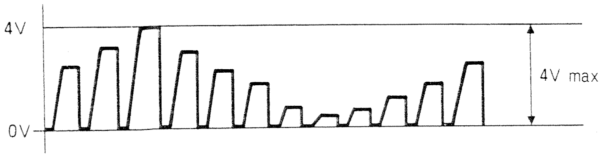


Fig. 32

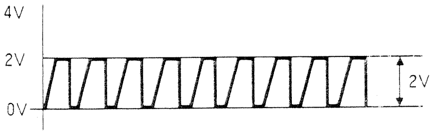
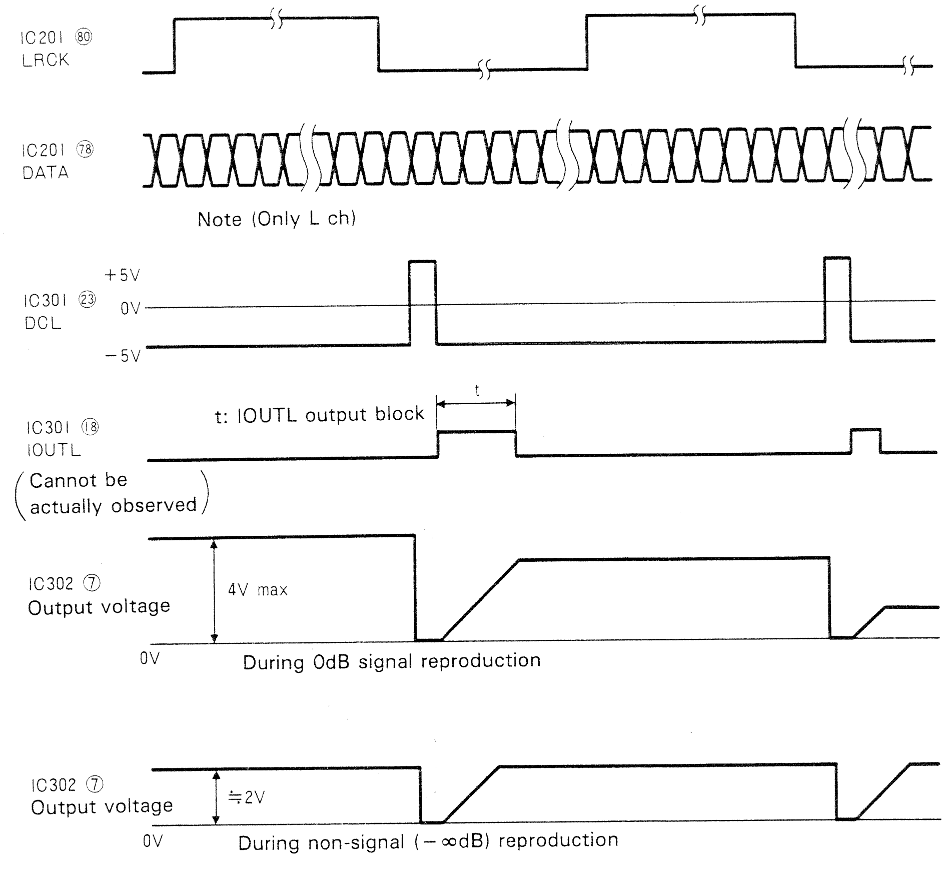


Fig. 33



IC201 (80)
LRCK
IC201 (78)
DATA
Note (Only L ch)
+5V
IC301 ㉓
DCL
0V
−5V
t
t: IOUTL output block
IC301 ⑱
IOUTL
(Cannot be actually observed)
IC302 ⑦
Output voltage
4V max
0V
During 0dB signal reproduction
IC302 ⑦
Output voltage
≒2V
0V
During non-signal (−∞dB) reproduction

Fig. 34

• Deglitch (IC303) and Sample Hold (IC304) Circuit the Following Gives Description for L-ch Only.

IC302 signal output is connected to the IC304 (−) input terminal through R306 and the IC303 switch. In regard to the IC303 switch, pin 15 and 1 are turned on by the LRCK "H" section output from IC201. Pin 15 and 2 are turned on by the "L" section, the signal from R306 drops to GND and the IC304 (−) input terminal is opened.

An approximate circuit when IC303 pin 15 and 1 are turned on is as shown in Fig. 35. At that time, the circuit functions as an ordinary amplifier.

IC302 output voltage is increased by this amplifier gain to become IC304 output (180° phase deviation).

Next, the IC303 switch becomes as shown in Fig. 35 when pin 15 and 2 become on.

IC302 is separated from IC304. However, since C318 is charged by the previous output voltage, the voltage is held between this.

Also, IC302 output is offset +2V, negative voltage is applied by R308, R310 and C314 so that the offset is cancelled. IC304 functions as an adder with 0V output. There is a +/− audio signal shift centered on 0V.

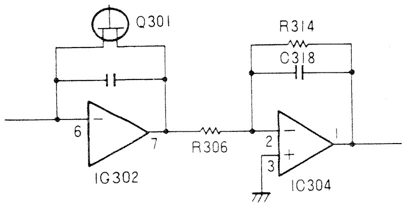


Fig. 35

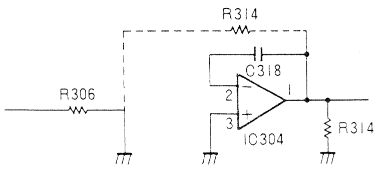


Fig. 36

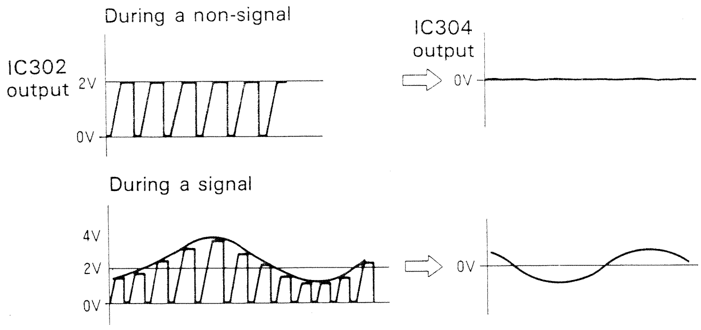
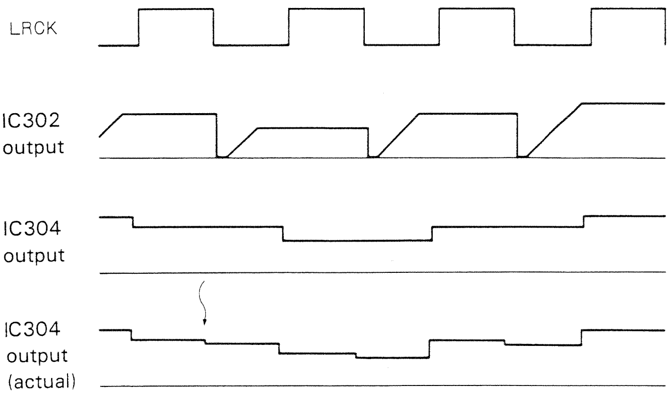


Fig. 37



There is a difference between the hold voltage and previous voltage influenced by a slight discharge of C318 and the IC offset voltage.

Fig. 38

• Low Pass Filter (IC305, 306) (LPF)

Since there is excessive spectral density in IC304 output, the frequency component in areas other than the audible zone is eliminated by an LPF provided with 6dB gain as well as an internal deemphasis circuit so that deemphasis ON/OFF can be controlled by applying +5V or −5V to pin 3. In regard to deemphasis ON/OFF, lead-out is performed by a disc sub-code, and signal output is by IC204 (CD controller). However, since IC204 output is 0V and 5V, the IC303 switch is controlled through Q307, then the switch selected voltage is applied to pin 3 of IC305. (Since IC305 pin 3 requires current, the Q307 collector cannot be directly connected.)

• Isolator (IC307) and Mute Circuit

The isolator is used to cancel noise that occurs on the GND line of the connection cable when it is connected to a cassette deck. GIN is the unit ground and GOUT is connected so that it drops to the GND level of the cassette deck.

When a CDX-2 audio signal is checked, this is performed by shorting GIN and GOUT or by shorting DIN cord pin 3 and the external side (wire mesh).

• PLL Circuit

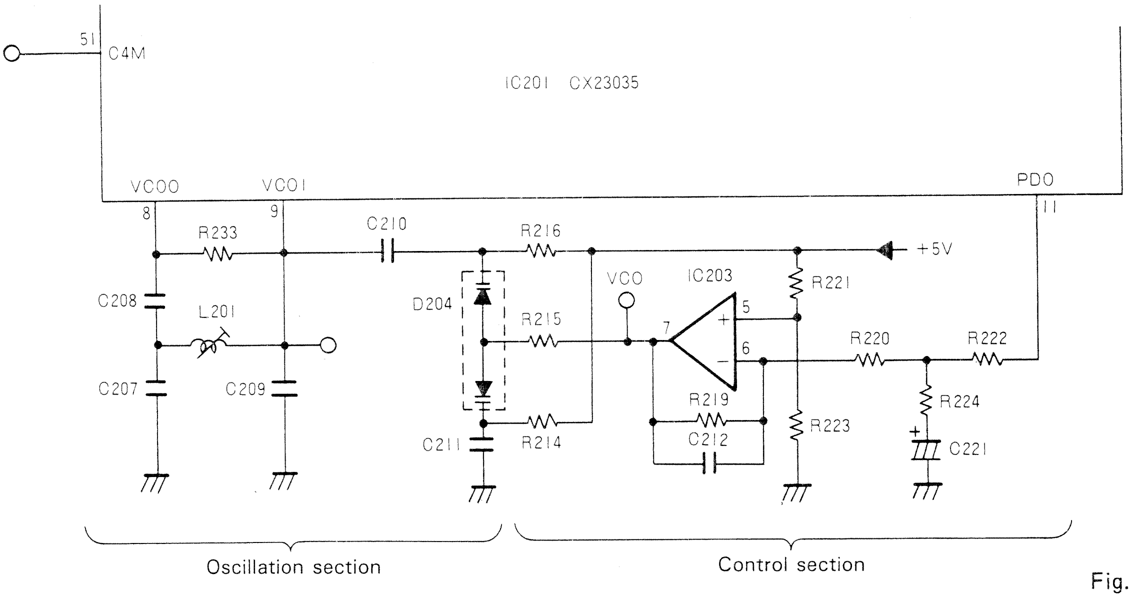


Fig. 39

This circuit is used to extract the EFM signal reproduction clock. The phase of the signal produced by the oscillation section and that of the EFM signal are compared, then the IC201 (PDO) pin 11 output result is amplified for application to the varicap (D204) anode. IC203 output is usually set for −0.5V during play. (Measured by a tester and millivolt meter. When it is measured by an oscilloscope, the voltage is seldom set because of overlapping high pass noise.)

When oscillation circuit frequency is high, the output is high (−0.5V → 0V → +2V) and when it is low, the output is low (−0.5V → −3V). The oscillation frequency is usually 8.643 MHz during play. However, if a measuring instrument is directly connected to the oscillation section, the circuit becomes unstable. Therefore precautions should be taken.

Also, PLL circuit lock or non-lock can be confirmed by IC201 pin 28 (GFS). When it is "H", a lock status occurs and when it is "L", a non-lock status occurs. When PLL lock does not occur, IC203 output is in a range from 0 to −1V.

• Key Scan

Positive pulse sequential output occurs from IC701 (PD4074D) pin 35—37 (KS1—KS3) with the timing shown in Fig. 40 when "L" voltage is applied to IC701 pin 2 (VSENSE).

Data is read from IC701 pin 18—21 (KD0—KD3) with "H" key scan timing which identifies a key that was pressed. When no key is pressed, usually pins 18—21 are all "L".

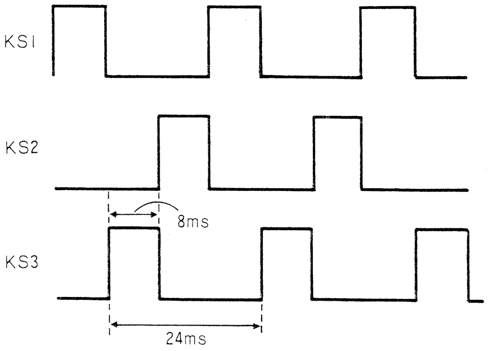


Fig. 40

• Display

The FL driver is built into IC701, which provides a direct FL display.

IC701 output is provided by the 9 grid output timing of pins 42—50 and the 8 segment output timing of pins 27—34. Also, since V—(—30V) is applied to pin 51, and pins 42—50 and 27—34 are pulled down to —30V, an output swing from —30V to +5V can be obtained, and FL is lit with grid and "H" segment timing. Also, —22.5V biased with 1.8Vrms AC is applied to the FL filament.

• AUX control circuit

When voltage (12V) is applied to the external control input DIS B line, Q704 is turned on and IC701 pin 6 becomes "L" which stops all operations until Q704 is turned off and pin 6 becomes "H" again. At that time, IC701 pin 54 becomes "L", Q707, 706 become off and the AUX +B output becomes "L".

AUX +B output indicates unit operation. When the player is operational, it is on together with Q706, 707 which provide ACC +B output. However, when independent player operation stops by an external operation stop command or by disc eject, "L" output occurs from IC701 pin 54, and Q706, 707 become off which stops AUX +B output.

The ILL line is a control line that lights night illumination by synchronizing with external units which are directly connected to the illumination circuit. When illumination is lit by the ILL line, IC701 pin 5 becomes "H" which reduces the display scan duty and performs dimmer operation.

• Search Mode

In regard to the search sequence, three steps (cross count search, step search, cueing step) are performed by a combination that depends on the situation.

• Cross count search (Fig. 41)

Computation of the shift direction and number of tracks is based on the present address and subject address to be searched.

When a command is sent to IC101 for tracking open, spindle CLV-H mode entry and the carriage voltage shifts toward a desired direction, carriage feed is by IC105 (carriage driver). Cross pulse output occurs from IC101 CNT (pin 6) every time one track is crossed and is sent to IC201. Next 1/256 frequency divided pulse output occurs from SENS (pin 18) of IC201 which is counted by IC204 (CD controller). When a prescribed track is crossed, reverse carriage drive occurs to apply a brake and to stop the pickup. (Since cross count search feed is with 256 track units, the fraction is shifted by a 128 track jump and multi jump.)

After braking is terminated, tracking close and tracking brake on occur and the spindle motor is changed to the CLV-A mode. Next, after 100ms, tracking brake off and carriage close occur and the present address is read in again. The number of tracks that are sent is computed again based on this address and the subject address. This operation is repeated until a subject address is reached. When a subject address is reached, shift to the final cueing step occurs. (In the last address search, a cueing step is not performed which terminates the search.)

The cross count search mentioned above can only be used when a subject address is known which is restricted to TOC data use and during search to the last address memory location. For a case other than that mentioned above, a step search (mentioned below) is performed.

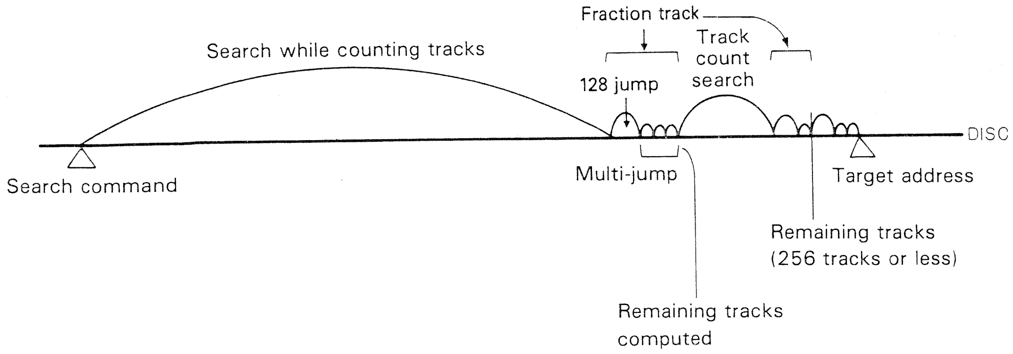

Fraction track
Search while counting tracks
Track count search
128 jump
DISC
Search command
Multi-jump
Target address
Remaining tracks (256 tracks or less)
Remaining tracks computed

Fig. 41 Cross count search (When the target address is known)

- **Step search (Fig. 42)**

The basic pickup shift method and brake output method are the same as that for cross count search. Step search is performed when a subject address is unknown. Since the number of tracks up to the subject address cannot be computed, a certain value is set and the target is reached step by step.

First, the number of tracks is set as 768 (256 x 3) to shift the pickup, then the address is checked. The pickup is shifted by 768 tracks each time by repeating this until the target is passed. When the target is passed, the pickup shift is reduced to 1/2 that of the original shift, then the pickup is shifted again by reversing the shift direction. This procedure is repeated by reducing the shift to 1/2 that of the previous shift every time the target is passed and by reversing the shift direction. After this, a shift is made to the cueing step.

- **Cueing step**

The spindle motor quartz servo is out of sync because the pickup was rapidly shifted in a radial disc direction due to cross count search and step search. Therefore it is necessary to terminate the search operation before the original subject address and shift to the play mode because a quartz servo pull in margin must be obtained and mute release timing must be checked.

Also, in regard to cross count search, since the reliability precision of data recorded on TOC is only 1 second even if pickup shift precision is improved, it is necessary to perform a fine adjustment of the pickup position when it shifts to the play mode. Therefore, when a subject address is reached, a 3-track jump back is performed during play. If INDEX = 0 exists, MUTE is released 1 second before the subject address to shift to play, and if INDEX = 0 does not exist, MUTE is released at the subject address.

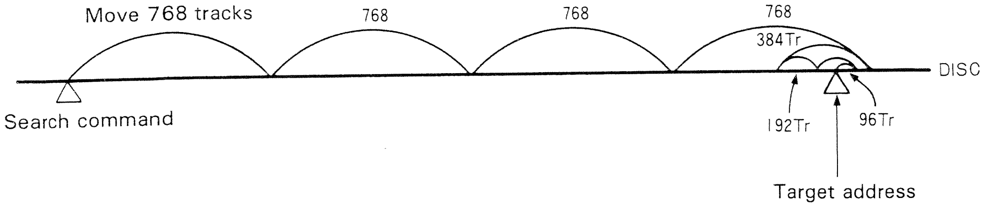

Move 768 tracks
768
768
768
384Tr
DISC
Search command
192Tr
96Tr
Target address

Fig. 42 Step search (When distance to target address is unknown)

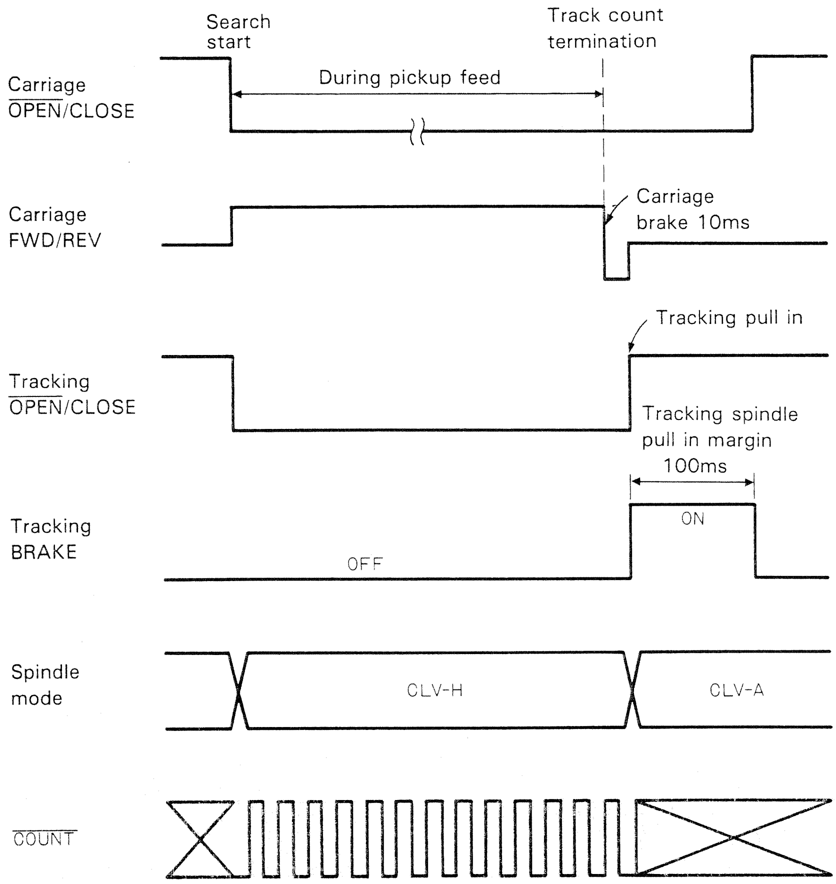


Fig. 43 Track, count sequence

- **Protective operation during search**

If the pickup jumps to the mirror face of the disc while it is being shifted, erroneous operation might occur. Therefore, it is necessary to provide quick pickup return to the inner circumference area where data is recorded. To accomplish this with IC204, the MIRR signal is checked with 1ms intervals while pickup shift occurs. When MIRR = "H" continues for 15ms, the projection of the pickup onto the mirror face is judged, the pickup shift direction is reversed, and a 100 track cross pulse count occurs to confirm that it has returned to the data face. Next, pickup shift stops, address read in occurs and and search continues. When the count is not terminated after 1 second has passed, it shifts to the STOP mode by judging that the servo system is abnormal, then it shifts to the set up mode again.

Also, when search cannot be performed after 10 seconds have passed due to an abnormality, stop occurs and the disc is ejected.

• Play Mode

The mode used for ordinary music playback. When no abnormality exists, active operation is not performed but monitoring of each part is performed in which the represenative pin status is as follows.

IC204
Pin 21 AMUTE "L"
Pin 22 $\overline{\text{XRST}}$ "H"
Pin 31 MUTG "L"
Pin 2 $\overline{\text{CBRAKE}}$ "H"

In regard to monitoring, the address of the reproduced location obtained by the FOK signal, GFS signal and the sub code is monitored once every 26ms. Also, carriage servo OPEN/CLOSE and emphasis ON/OFF switching is performed. The FOK signal indicates focus or out of focus to detect an abnormal focus servo system. If the FOK signal is "L" for 100ms, it is judged that the focus servo system is abnormal, then it shifts to the STOP mode.

The GFS signal indicates spindle PLL circuit lock or no lock to detect an abnormal spindle system. IF the GFS signal is "L" for more than 2 seconds, it is judged that the spindle system is abnormal, then it shifts to the STOP mode.

When a sound jump occurs during play reproduction due to a sudden shock, the pickup can be returned to an address that continues to the address just before the sound jump occured so that reproduction can continue and abnormal music reproduction can be performed. In regard to reproduction address monitoring, the reference address to be read out next is internally computed based on the reproduction position address that was read during play. When the address is read out next, the internally generated address is compared to the address that was actually read out. As a result, if a difference of more than 1 second exists 5 times continuously, it is judged that sound jump occurred due to some reason, and the reference address is searched as a target address.

To operate the function for sound jump return by monitoring the address of the reproduction location, it is necessary for the sub-code to be read correctly. Therefore, the sub code is checked during play to see if it can be read or not. When it cannot be read 16 times continuously, a shift is made to the STOP mode.

The purpose of carriage servo OPEN/CLOSE selection is to conserve power. When the pickup lens is near the center, servo open occurs and when it deviates from the center, servo close occurs which moves the carriage to move the lens relatively toward the center against the pickup.

Emphasis ON/OFF selection is performed to change the frequency characteristics of the reproduction system by matching the music emphasis ON/OFF during reproduction which is switched according to sub code data that was read in.

• Address read out by a sub code

In regard to sub code Q-channel demodulation, SCOR, WFCK, SUBQ signal output by the signal processing IC (IC201) is read out by IC204 to perform a CRC check.

SCOR is a synchronous 98 bit 1-frame sub code signal while WFCK is a serial clock for the 98 bit sub code, and SUBQ is sub code Q channel control data. Fig. 44 shows the timing for these signals.

As evident in this figure, SCOR = H wait occurs and SUBQ data is read in with 96 bits at the WFCK rising edge at the frame sync point, then a CRC check is performed and the sub code is fetched. Since 1 cycle of WFCK is 136 μs, and the sub code consists of 98 bit data including the SCOR sync pattern, about 13.3 ms is necessary for a one time fetch of the sub code.

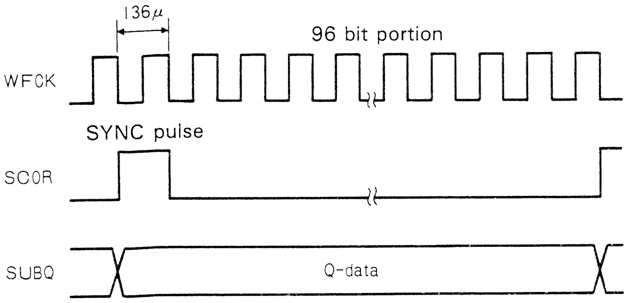


Fig. 44 Sub code read out timing

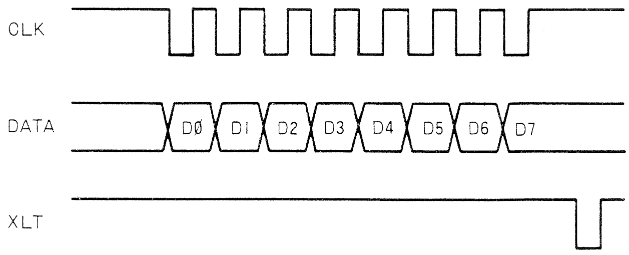


Fig. 45 Serial data output timing

• FF, REV Mode

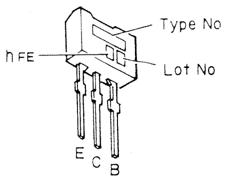
A fast feed mode. In the FF mode, "sub code read once as a 2—7 track jump" is repeated toward the outer circumference, and in the REV mode, it is repeated toward the inner circumference. In regard to the number of tracks, 7 tracks are provided on the inner circumference and 2 tracks are provided on the extreme outer circumference so that the fast feed speed becomes constant at both the outer and inner circumference. When the FF mode exists at the extreme outer circumference, it shifts to the Play mode by a return to the extreme inner surface even if the REV mode exists. Also, when TR and index changes occur in the FF, REV mode, a shift to the Play mode occurs at this point.

• Protective Operation

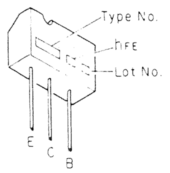
1) When a disc is pulled out during loading and the disc switch is closed, the eject operation occurs.
2) When the REAR switch is not closed 6 seconds after loading has started, the eject operation occurs.
3) When the servo system has trouble and does not recover after 15 seconds have passed, the eject operation occurs.
4) When an operation does not terminate within 7.5 seconds after the eject (loading) operation has started, the loading (eject) operation occurs.
5) When section 4 operation occurs 4 times continuously, the mechanism enters a stop status. If the eject key is pressed during this status, the eject operation starts.
6) When loading is performed by inserting a new disc to enter the set up mode, if servo close has not occurred, focus cannot be performed or tracking cannot be closed, it shifts to the eject operation after finding that the back of the disc is being read. Since disc reload is not accepted in this case, when loading is performed again, it must be performed after removing the disc once.
7) When the focus shifts and the servo system has trouble such as spindle miss lock, if the servo system does not recover to a normal status after 15 seconds have passed, the disc is ejected by a judgement that continuous vibration is applied to the set.
8) If the status does not change after 10 seconds have passed when a carriage shift is attempted such as when the carriage mechanism does not move or search does not occur, the disc is ejected by a judgement that the carriage mechanism has trouble.
9) When data cannot be exchanged continuously 3 times during communication, the disc is ejected by a judgement that a communication error has occurred.
10) When the temperature detection circuit detects a high temperature and makes IC701 pin 7 ($\overline{\text{TEMP}}$) low, "HH HHHH" is displayed in a high temperature detection protective operation which turns the DC/DC converter (IC601) off to enter a release status. When $\overline{\text{TEMP}}$ returns to a HIGH status, play is reopened at the address just before release.

●ICs and Transistors

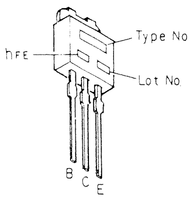
2SD1226M


Type No
hFE
Lot No
E
C
B

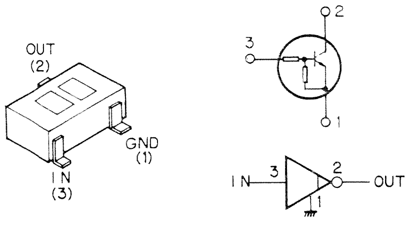
2SB822F


Type No.
hFE
Lot No.
E
C
B

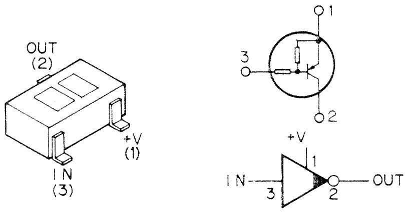
2SC3074


Type No
hFE
Lot No.
B
C
E

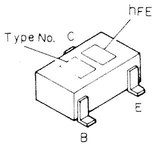
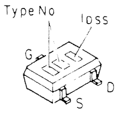
UN2211


OUT
(2)
GND
(1)
IN
(3)
2
3
1
IN
3
2
OUT
1

UN2111

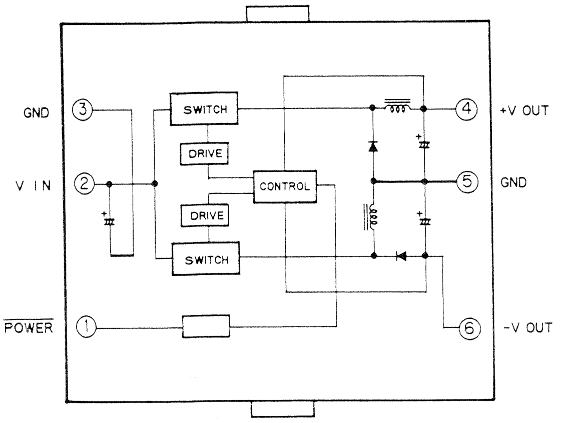

OUT
(2)
+V
(1)
IN
(3)
1
3
2
+V
1
IN
3
2
OUT

Chip Transistor

Part No.	Indication (Type No., hFE)	
2SD1048-X6	X6	 hFE Type No. C E B
2SD1048-X7	X7	
2SD1048-X8	X8	
2SD601-YQ	YQ	
2SD601-YR	YR	
2SC2712-LG	LG	 Type No Idss G D S
2SC2712-LY	LY	
2SK508-K52	K52	
2SK508-K53	K53	

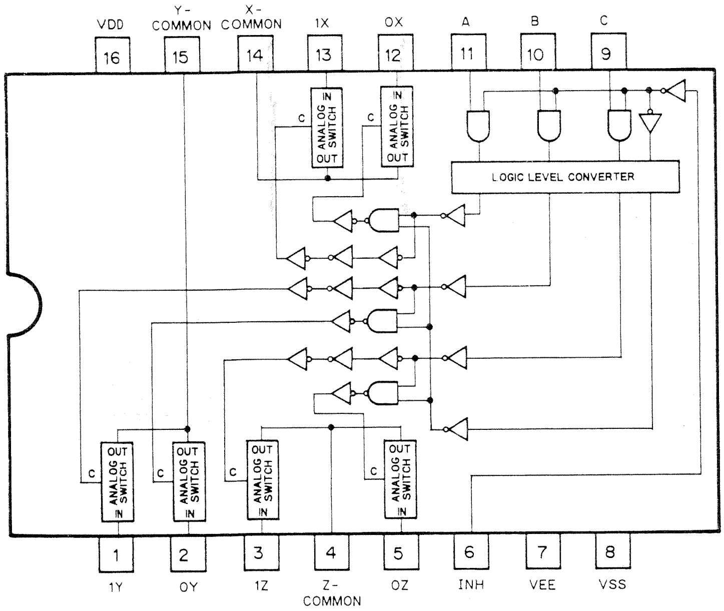
Power Supply Assy

IC601: KHA803


GND
V IN
POWER
③
②
①
SWITCH
DRIVE
CONTROL
DRIVE
SWITCH
④
⑤
⑥
+V OUT
GND
-V OUT

Main Assy

IC303: TC4053BF

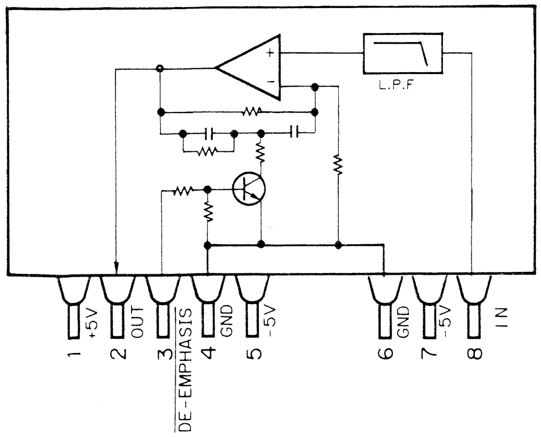

VDD
Y-COMMON
X-COMMON
1X
0X
A
B
C
16
15
14
13
12
11
10
9
IN
ANALOG SWITCH
OUT
C
LOGIC LEVEL CONVERTER
OUT
ANALOG SWITCH
IN
1
2
3
4
5
6
7
8
1Y
0Y
1Z
Z-COMMON
0Z
INH
VEE
VSS

TC4053BF is a 2 channel x 3 multiplexer that enables an analog signal, digital signal selection and combination. The corresponding switch of each channel is turned on by a control terminal digital signal.

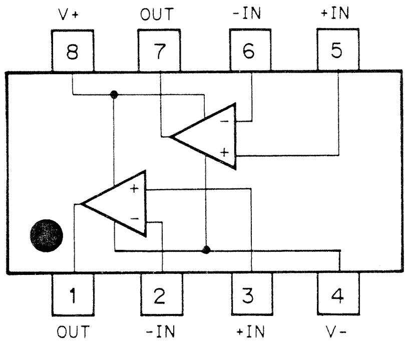
Truth Table for TC4053 BF

Control input				"ON" channel
INH	C	B	A	
L	L	L	L	0X, 0Y, 0Z
L	L	L	H	1X, 0Y, 0Z
L	L	H	L	0X, 1Y, 0Z
L	L	H	H	1X, 1Y, 0Z
L	H	L	L	0X, 0Y, 1Z
L	H	L	H	1X, 0Y, 1Z
L	H	H	L	0X, 1Y, 1Z
L	H	H	H	1X, 1Y, 1Z

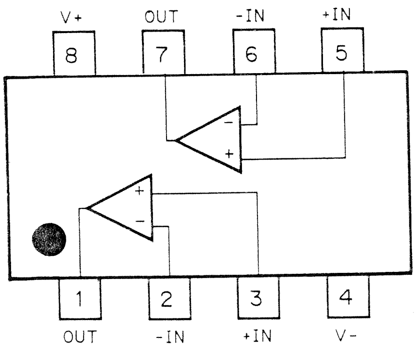
IC305, 306: KHA210A


L.P.F
+5V
OUT
DE-EMPHASIS
GND
-5V
GND
-5V
IN
1
2
3
4
5
6
7
8

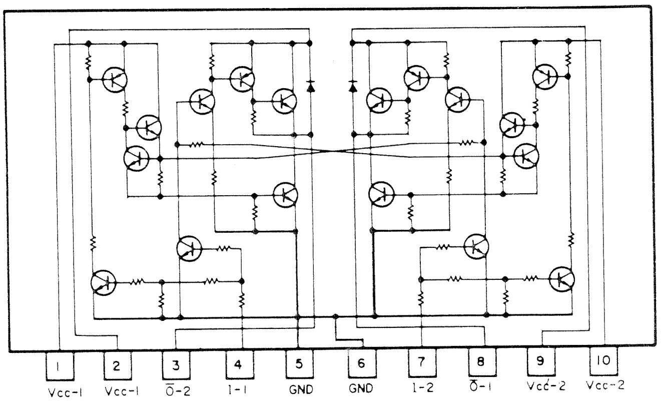
IC102, 103, 203, 307: M5218FP


V+
OUT
-IN
+IN
8
7
6
5
1
2
3
4
OUT
-IN
+IN
V-

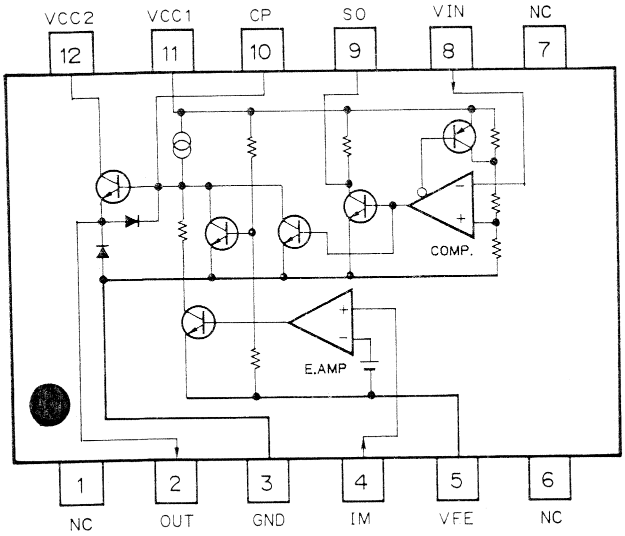
IC302, 304: M5221FP(NJM072M)


V+
OUT
-IN
+IN
8
7
6
5
1
2
3
4
OUT
-IN
+IN
V-

IC401: M54546L


1
2
3
4
5
6
7
8
9
10
Vcc-1
Vcc-1
Ō-2
I-1
GND
GND
I-2
Ō-1
Vcc-2
Vcc-2

IC2: IR3C05

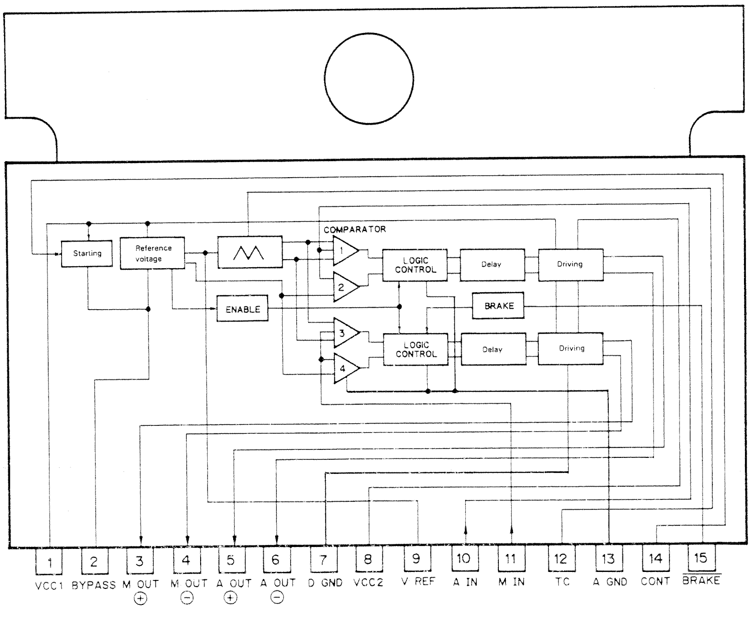

VCC2
VCC1
CP
SO
VIN
NC
12
11
10
9
8
7
COMP.
E.AMP
1
2
3
4
5
6
NC
OUT
GND
IM
VFE
NC

IR3C05 Terminal Function

Laser diode constant light output drive IC

Pin No.	Pin name	I/O	Function and operation
1	NC		
2	OUT	Output	Output
3	GND		Ground
4	IM	Input	Monitor input
5	VEE		(–) power supply
6	NC		
7	NC		
8	VIN	Input	Control input (ON/OFF), thermal shutoff
9	SO	Output	Operation signal output. "H" during operation, "L" during stop.
10	CP		Phase compensation
11	VCC1		Control (+) power supply
12	VCC2		Output (+) power supply

IC104, 105: PA3021A


COMPARATOR
Starting
Reference voltage
ENABLE
1
2
3
4
LOGIC CONTROL
Delay
Driving
BRAKE
LOGIC CONTROL
Delay
Driving
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
VCC1
BYPASS
M OUT ⊕
M OUT ⊖
A OUT ⊕
A OUT ⊖
D GND
VCC2
V REF
A IN
M IN
TC
A GND
CONT
BRAKE

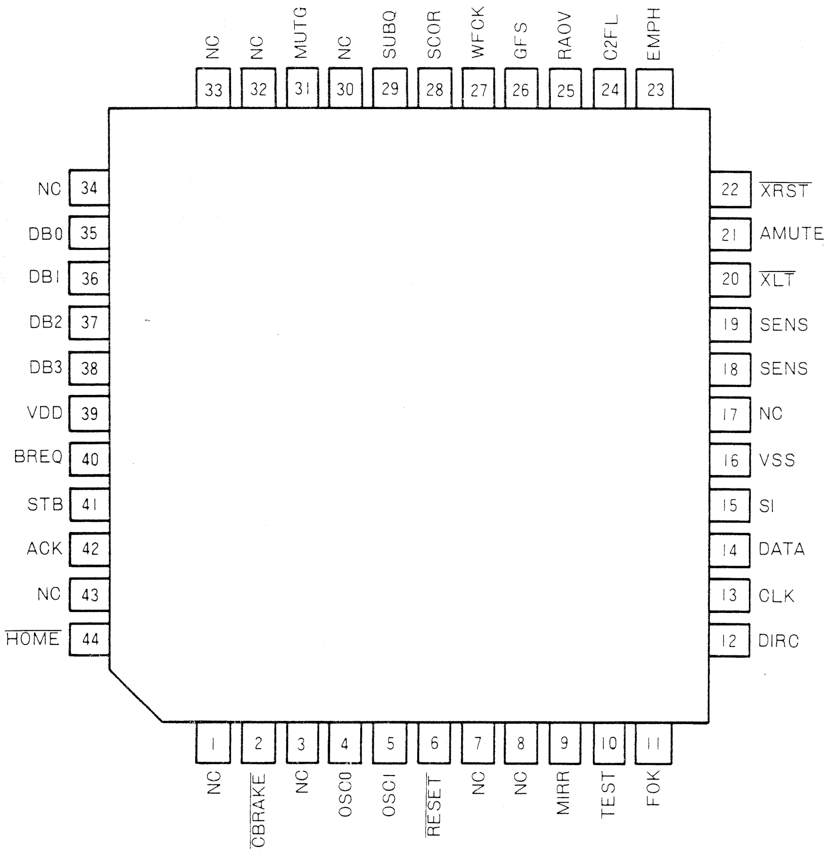
PA3021A Terminal Functions

PWM driver

Pin No.	Pin name	I/O	Function and operation
1	VCC1		ACC power supply
2	BYPASS		IC reference voltage ripple filter condensor connection terminal
3	MOUT+	Output	Motor driver positive output terminal
4	MOUT–	Output	Motor driver negative output terminal
5	AOUT+	Output	Actuator driver positive output terminal
6	AOUT–	Output	Actuator driver negative output terminal
7	DGND		Power step GND terminal
8	VCC2		+5V power supply
9	Vref	Output	IC stabilizing supply output terminal
10	AIN	Input	Actuator system analog signal input terminal
11	MIN	Input	Motor system analog signal input terminal
12	TC		Chopping waveform condensor connection terminal
13	AGND		Small signal system GND terminal
14	CONT	Input	Circuit operation status, standby status selection terminal. Active "H".
15	BRAKE	Input	Motor system operation, non-operation (STOP) selection terminal. Active "L".

*IC204 : PD8019E

*IC's marked by * are MOS type.*
Be careful in handling them because they are very liable to be damaged by electrostatic induction.


NC 33
NC 32
MUTG 31
NC 30
SUBQ 29
SCOR 28
WFCK 27
GFS 26
RAOV 25
C2FL 24
EMPH 23
NC 34
DB0 35
DB1 36
DB2 37
DB3 38
VDD 39
BREQ 40
STB 41
ACK 42
NC 43
HOME 44
22 XRST
21 AMUTE
20 XLT
19 SENS
18 SENS
17 NC
16 VSS
15 SI
14 DATA
13 CLK
12 DIRC
1 NC
2 CBRAKE
3 NC
4 OSC0
5 OSCI
6 RESET
7 NC
8 NC
9 MIRR
10 TEST
11 FOK

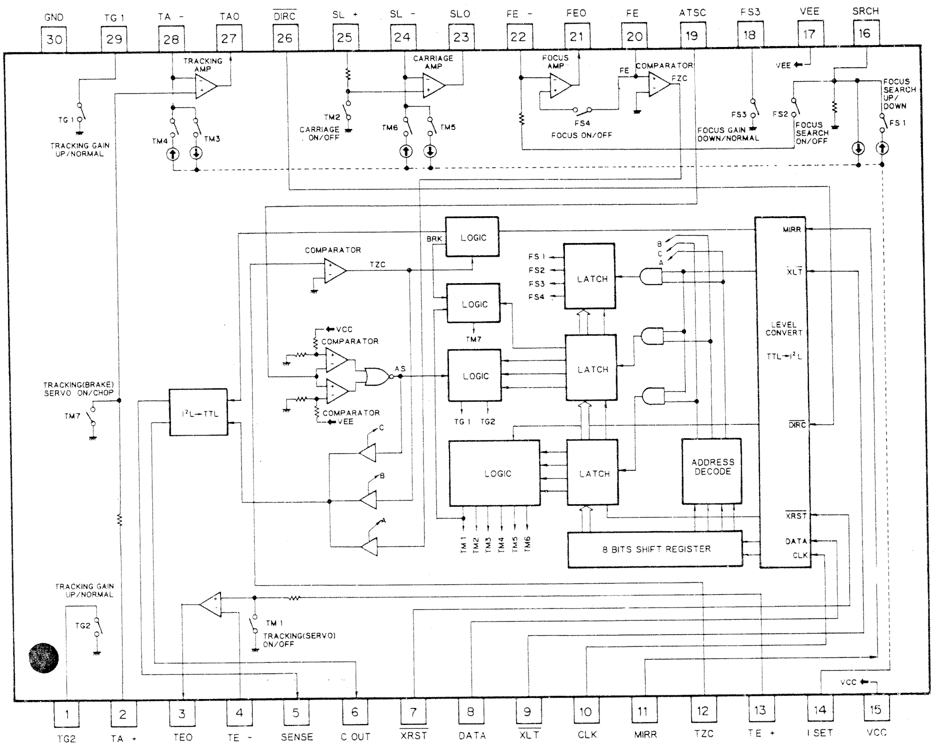
PD8019E Terminal Function

CD controller

Pin No.	Pin name	I/O	Function and operation
1	NC		
2	$\overline{\text{CBRAKE}}$	Output	Carriage motor brake terminal. N-ch open drain with pull up. "L": Brake ON.
3	NC		
4	OSC0	Input	Clock oscillation terminal. 4MHz
5	OSC1	Output	Clock oscillation terminal
6	$\overline{\text{RESET}}$	Input	ICreset terminal. N-ch open drain with pull up. "L": Reset ON. "H" = Reset OFF.
7	NC		
8	NC		
9	MIRR	Input	Mirror signal input terminal. Input port with latch. "H": Mirror face, between tracks.
10	TEST	Input	Normal mode/chip check mode selection terminal. Input port with latch.
11	FOK	Input	FOCUS OK signal input termianl. Input port with latch. "H": Focus OK
12	DIRC	Output	Single jump control terminal. N-ch open drain with pull up.
13	CLK	Output	Serial data transmission clock output. N-ch open drain with pull up.
14	DATA	Output	Serial data output. N-ch open drain with pull up. Controls CX20108 and CX23035.
15	SI	Input	Chip checking command input terminal. N-ch open drain with pull up.
16	VSS		GND
17	NC		
18	SENS	Input	Sense signal input terminal. N-ch open drain with pull up.
19	SENS	Input	Sense signal input terminal. N-ch open drain with pull up.
20	$\overline{\text{XLT}}$	Output	Serial data latch pulse. N-ch open drain with pull up.
21	AMUTE	Output	Audio signal mute. N-ch open drain with pull up.
22	$\overline{\text{XRST}}$	Output	Reset terminal. N-ch open drain with pull up. Resets the shift registers, CX20108, CX23035.
23	EMPH	Output	Emphasis ON/OFF selection terminal. N-ch open drain with pull up. "H": Emphasis ON.
24	C2FL	Input	Error correction NG monitor input terminal. N-ch open drain with pull up.
25	RAOV	Input	Jitter extraction RAM overflow. N-ch open drain with pull up.
26	GFS	Input	Spindle lock detection. N-ch open drain with pull up. "H ' during spindle lock.
27	WFCK	Input	Sub code read out clock. N-ch open drain with pull up.
28	SCOR	Input	Sub code sync. N-ch open drain with pull up.
29	SUBQ	Input	Sub code data. N-ch open drain with pull up.
30	NC		
31	MUTG	Output	Signal processing mute. N-ch open drain with pull up.
32 – 34	NC		
35 – 38	DB0 – DB3	I/O	Communication data bus. N-ch open drain with pull up.
39	VDD		Power supply terminal. +5V

<table>
<tr><th>Pin No.</th><th>Pin name</th><th>I/O</th><th>Function and operation</th></tr>
<tr><td>40</td><td>BREQ</td><td>Input/Output</td><td>Communication control line. N-ch open drain with pull up.
● Data link control.
Communication bus is enabled by "L" status entry from an "H" status. At the same time, the communication mode is determined by the ACK output level.
<table><tr><th>ACK</th><th>Communication mode</th></tr><tr><td>"L"</td><td>Indicates that PD8019 can accept a command. Response for STB output from PD4074D with 1ms maximum.</td></tr><tr><td>"H"</td><td>Indicates a data send request status for PD4074D.
The wait time from this status until a response by PD4047D is 5ms maximum.</td></tr></table>● Handshake control
When a data string is sent, "L" output occurs simulaneously with first data sending, and "H" output occurs with last data sending to indicate data string termination.</td></tr>
<tr><td>41</td><td>STB</td><td>Input</td><td>Communication control line
● Handshake control. N-ch open drain with pull up.
Communication direction (PD4074D → PD8019E)
Indicates that PD4074D data output at the rise of this signal is effective.
Communication direction (PD8019E → PD4074D)
Incicates that data output at the rise of this signal was accepted by PD4074D.</td></tr>
<tr><td>42</td><td>ACK</td><td>Output</td><td>Communication control line. N-ch open drain with pull up.
● Data link control
The communication mode is determined by the level of this signal.
● Handshake control
Communication direction (PD4074D → PD8019E)
Outputs "H" which indicates that data output by PD4074D was accepted.
Communication direction (PD8019E → PD4074D)
Outputs "L" which indicates that data output for PD4074D is effective.</td></tr>
<tr><td>43</td><td>NC</td><td></td><td></td></tr>
<tr><td>44</td><td>$\overline{\text{HOME}}$</td><td>Input</td><td>HOME switch detection terminal. N-ch open drain with pull up.
Terminal that determines the pickup home position.
Home position: Location where this terminal changes from "L" to "H".</td></tr>
</table>

* IC101: CX20108


GND 30
TG1 29
TA − 28
TAO 27
DIRC 26
SL + 25
SL − 24
SLO 23
FE − 22
FEO 21
FE 20
ATSC 19
FS3 18
VEE 17
SRCH 16
TRACKING AMP
CARRIAGE AMP
FOCUS AMP
COMPARATOR
FZC
FOCUS SEARCH UP/DOWN
TRACKING GAIN UP/NORMAL
TM2
TM3
TM4
TM5
TM6
CARRIAGE ON/OFF
FS4 FOCUS ON/OFF
FOCUS GAIN DOWN/NORMAL
FOCUS SEARCH ON/OFF
FS1
FS2
FS3
LOGIC
BRK
LATCH
MIRR
XLT
LEVEL CONVERT
TTL→I²L
DIRC
ADDRESS DECODE
XRST
DATA
CLK
8 BITS SHIFT REGISTER
TZC
COMPARATOR
VCC
VEE
AS
TM7
TG1 TG2
TM1 TM2 TM3 TM4 TM5 TM6
I²L→TTL
TRACKING(BRAKE) SERVO ON/CHOP
TRACKING GAIN UP/NORMAL
TG2
TM1 TRACKING(SERVO) ON/OFF
1 TG2
2 TA +
3 TEO
4 TE −
5 SENSE
6 C OUT
7 XRST
8 DATA
9 XLT
10 CLK
11 MIRR
12 TZC
13 TE +
14 I SET
15 VCC

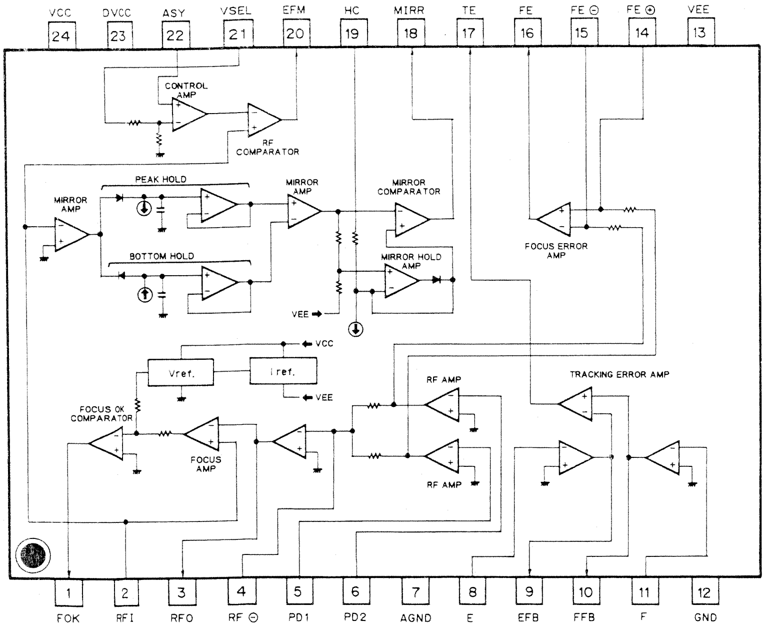
CX20108 Terminal Functions

Focus, tracking, carriage servo IC

Pin No.	Pin name	I/O	Function and operation
1	TG2	Output	Tracking amplifier gain selection terminal. Becomes open or GND level.
2	TA+	Input	Amp 2 (tracking amp) non-inverted input. Tracking error signal input.
3	TEO	Output	Amp 4 (tracking amp) output. Tracking error signal output.
4	TE–	Input	Amp 4 (tracking amp) inverted input.
5	SENSE	Output	Outputs an IC status that corresponds to the DATA address. (Changes with addres content of internal serial resgister.)
6	C OUT	Output	Track number counting signal output during high speed access.
7	XRST	Input	Clears all internal registers when "L".
8	DATA	Input	Serial data input from CD controller (IC204). Inputted by LSB. D0–D7.
9	XLT	Input	DATA latch (The content of the internal serial shift register is transferred to a latch that was address-decoded.) Transferred with "L". Since it is not an edge trigger, it is necessary to return it to H after execution.
10	CLK	Input	DATA transfer clock. Data transferred at the trailing edge.
11	MIRR	Input	Mirror signal input from RF amplifier.
12	TZC	Input	Tracking zero cross. Tracking error signal is inputted with a C coupler. Although the time constant is determined by the 1 track jump situation, it is usually about 2 kHz.
13	TE+	Input	Tracking error signal input.
14	ISET		Current value setting that determines the focus search voltage, tracking jump voltage and the carriage feed voltage.
15	VCC		Power supply terminal. Usually +5V.
16	SRCH		Connects a condensor that determines the focus search charge and discharge waveform time constant.

Pin No.	Pin name	I/O	Function and operation
17	Vee		Power supply terminal. −5V
18	FS3	Input	Focus amplifier gain selection terminal. OPEN or GND level.
19	ATSC	Input	Terminal that inputs data that indicates mechanical shock was applied to the player. Tracking error input through BPF.
20	FE	Input	Focus error signal input.
21	FEO	Output	Amp 1 output. Focus error signal output.
22	FE−	Input	Amp 1 invert input.
23	SLO	Output	Amp 3 output. Carriage servo signal output.
24	SL−	Input	Amp 3 invert input.
25	SL+	Input	Amp 3 non-invert input. Carriage servo signal input.
26	$\overline{\text{DIRC}}$	Input	Utilized during 1 track jump. Usually "H". WHen "L" reverses the track jump pulse direction. Set to a normal tracking mode by "H". When TZC rise and fall detection occurs, it is "L" for a certain period of time.
27	TAO	Output	Amp 2 output. Tracking error signal output.
28	TA−	Input	Amp 2 invert input. Tracking error signal input.
29	TG1		Tracking amp gain selection terminal. Becomes OPEN or GND level.
30	GND		GND terminal

* IC1: CX20109


VCC
DVCC
ASY
VSEL
EFM
HC
MIRR
TE
FE
FE ⊖
FE ⊕
VEE
24
23
22
21
20
19
18
17
16
15
14
13
CONTROL AMP
RF COMPARATOR
PEAK HOLD
MIRROR AMP
MIRROR AMP
MIRROR COMPARATOR
BOTTOM HOLD
MIRROR HOLD AMP
VEE
FOCUS ERROR AMP
VCC
Vref.
Iref.
VEE
FOCUS OK COMPARATOR
FOCUS AMP
RF AMP
RF AMP
TRACKING ERROR AMP
1
2
3
4
5
6
7
8
9
10
11
12
FOK
RFI
RFO
RF ⊖
PD1
PD2
AGND
E
EFB
FFB
F
GND

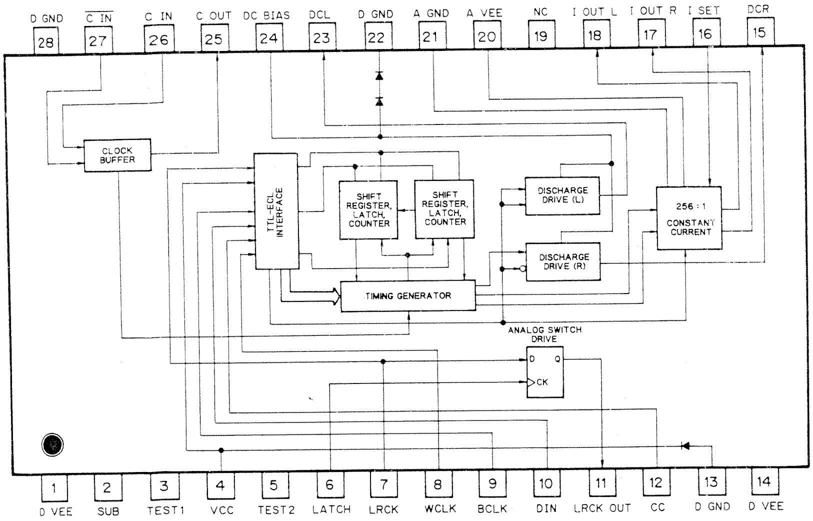
CX20109 Terminal Functions

RF amplifier

Pin No.	Pin name	I/O	Function and operation
1	FOK	Output	Allows focus servo output. Active "H". PNP open collecter.
2	RFI	Input	RF summing amp output is C coupled for input.
3	RFO	Output	RF summing amp output. Eye pattern test point.
4	RF−	Input	RF summing amp invert input. CR return connection to (3) — (4).
5	PD1	Input	RF I-V amp (1) invert input. Connects to PIN diode B+D for current input.

Pin No.	Pin name	I/O	Function and operation
6	PD2	Input	RF I-V amp (2) invert input. Connects to PIN diode A+C for current input.
7	AGND		Small signal analog system GND.
8	E	Input	E I-V amp invert input. Connects to PIN diode E for current input.
9	EFB	Output	E I-V amp output. CR return connection to (8) – (9).
10	FFB	Output	F I-V amp output. CR return connection to (10) – (11).
11	F	Input	F I-V amp invert input. Connects to PIN diode F for current input.
12	GND		
13	V_{EE}		Negative power supply. –5V.
14	FE+	Input	Focus error amp non-invert input. Low pass CR connection.
15	FE–	Input	Focus error amp invert input.
16	FE	Output	Focus error amp output. CR return connection to (15) – (16).
17	TE	Output	Tracking error amp output.
18	MIRR	Output	Mirror output. Active "H". PNP open collector.
19	HC	Input	Mirror hold condensor connection terminal.
20	EFM	Output	EFM output comparator output.
21	VSEL	Input	Auto, asymmetry control amp reference input level selection terminal. Connects to +5V.
22	ASY	Input	Auto, asymmetry control input. Slice the RF signal to generate a square wave.
23	DVcc		EFM comparator system positive power supply. Connects to +5V.
24	Vcc		Positive power supply. Connects to +5V.

*IC301: CX20133


D GND
C IN
C IN
C OUT
DC BIAS
DCL
D GND
A GND
A VEE
NC
I OUT L
I OUT R
I SET
DCR
28
27
26
25
24
23
22
21
20
19
18
17
16
15
CLOCK BUFFER
TTL-ECL INTERFACE
SHIFT REGISTER, LATCH, COUNTER
SHIFT REGISTER, LATCH, COUNTER
DISCHARGE DRIVE (L)
DISCHARGE DRIVE (R)
256 : 1 CONSTANT CURRENT
TIMING GENERATOR
ANALOG SWITCH DRIVE
D
Q
CK
1
2
3
4
5
6
7
8
9
10
11
12
13
14
D VEE
SUB
TEST1
VCC
TEST2
LATCH
LRCK
WCLK
BCLK
DIN
LRCK OUT
CC
D GND
D VEE

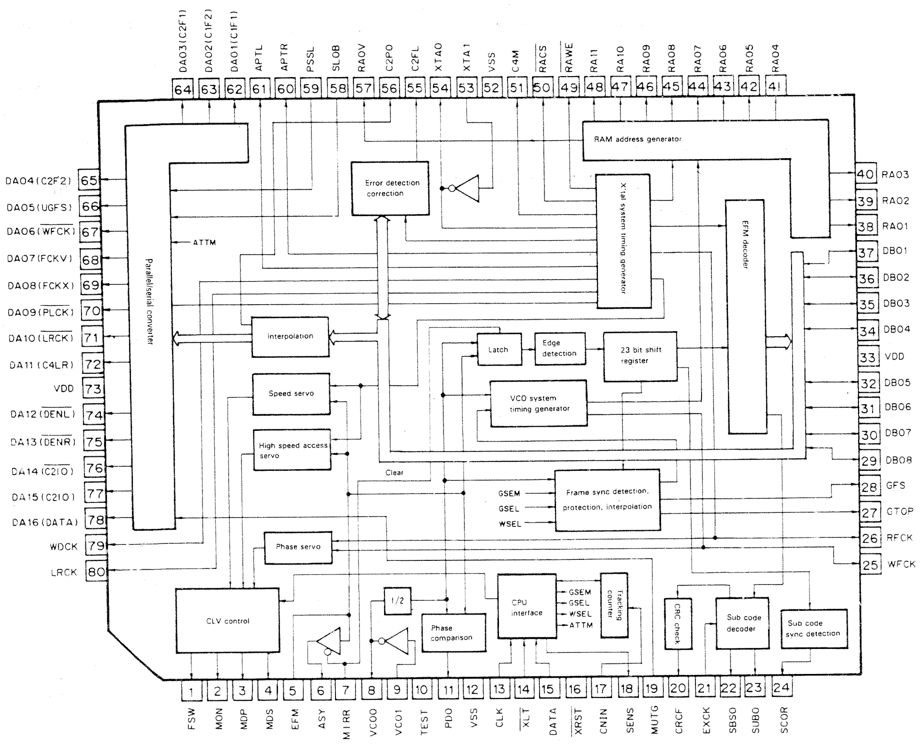
CX20133 Terminal Functions

16 bit D/A converter

Pin No.	Pin name	I/O	Function and operation
1	DVEE		– power supply terminal. –5V.
2	SUB		–5V
3	TEST1		Not used
4	VCC		+ power supply terminal. +5V.
5	TEST2		Not used.
6	LATCH	Input	Clock input. When PAM waveform jitter exists, a conversion error occurs. D type flip flop clock for this jitter.

Pin No.	Pin name	I/O	Function and operation
7	LRCK	Input	44.1 kHz strobe signal input. Data assignment during the stereo mode. LRCK = "L" — — — R ch data call. LRCK = "H" — — — L ch data call.
8	WCLK	Input	88.2 kHz strobe signal input. Word clock. Changes WCLK from "H" to "L" at 17th BCLK break, then 16 bit data is transferred from the shift register to the latch by this break signal.
9	BCLK	Input	Bit clock input. Data is sent to the IC sequentially from MSB by synchronization with the rise of this clock. (Data change is by BCLK break.)
10	DIN	Input	16 bit serial data input.
11	LRCKOUT	Output	TC4053BF (CMOS analog switch) drive output.
12	CC	Input	Conversion command. Changes CC to "H" and enters 3 clocks or more from CIN to reset all internal timing circuits. After reset, CC becomes "L" and enters a clock from CIN, then the internal timing circuit starts operating.
13	DGND		GND
14	DVEE		−5V
15	DCR	Output	Discharge signal Controlled by LRCK LRCK = "H" — — — Output from DCR. LRCK = "L" — — — Output from DCL
16	ISET	Input	Integrating current determination terminal. Integrating current is determined by a constant current value that flows from this terminal.
17	IOUTR	Output	Integrating current output terminal LRCK = "L" — — — Output from IOUTL LRCK = "H" — — — Output from IOUTR
18	IOUTL	Output	
19	NC		
20	AVEE		−5V
21	AGND		GND
22	DGND		GND
23	DCL	Output	Discharge signal Controlled by LRCK. LRCK = "L" — — — Output from DCL. LRCK = "H" — — — Output from DCR.
24	DCBIAS		Bias terminal Bias circuit for the discharge signal output circuit.
25	COUT	Output	Clock terminal. 35 MHz.
26	CIN	Input	Clock terminal. 35 MHz.
27	$\overline{\text{CIN}}$	Input	Clock terminal. 35 MHz.
28	DGND		GND

*IC201: CX23035


DA03(C2F1)
DA02(C1F2)
DA01(C1F1)
APTL
APTR
PSSL
SLOB
RAOV
C2PO
C2FL
XTAO
XTA1
VSS
C4M
RACS
RAWE
RA11
RA10
RA09
RA08
RA07
RA06
RA05
RA04
64
63
62
61
60
59
58
57
56
55
54
53
52
51
50
49
48
47
46
45
44
43
42
41
RAM address generator
Error detection correction
X'tal system timing generator
EFM decoder
ATTM
Parallel/serial converter
Interpolation
Latch
Edge detection
23 bit shift register
VCO system timing generator
Speed servo
High speed access servo
Clear
GSEM
GSEL
WSEL
Frame sync detection, protection, interpolation
Phase servo
CLV control
1/2
Phase comparison
CPU interface
GSEM
GSEL
WSEL
ATTM
Tracking counter
CRC check
Sub code decoder
Sub code sync detection
DA04(C2F2) 65
DA05(UGFS) 66
DA06(WFCK) 67
DA07(FCKV) 68
DA08(FCKX) 69
DA09(PLCK) 70
DA10(LRCK) 71
DA11(C4LR) 72
VDD 73
DA12(DENL) 74
DA13(DENR) 75
DA14(C2IO) 76
DA15(C2IO) 77
DA16(DATA) 78
WDCK 79
LRCK 80
40 RA03
39 RA02
38 RA01
37 DB01
36 DB02
35 DB03
34 DB04
33 VDD
32 DB05
31 DB06
30 DB07
29 DB08
28 GFS
27 CTOP
26 RFCK
25 WFCK
1 FSW
2 MON
3 MDP
4 MDS
5 EFM
6 ASY
7 MIRR
8 VCOO
9 VCO1
10 TEST
11 PDO
12 VSS
13 CLK
14 XLT
15 DATA
16 XRST
17 CNIN
18 SENS
19 MUTG
20 CRCF
21 EXCK
22 SBSO
23 SUBO
24 SCOR

CX23035 Terminal Functions

Digital signal processor

Pin No.	Pin name	I/O	Function and operation
1	FSW	Output	Spindle motor output filter time constant selection output.
2	MON	Output	Spindle motor ON/OFF control output.
3	MDP	Output	Spindle motor drive output. Rough control during CLV-S mode and phase control during CLV-P mode.
4	MDS	Output	Spindle motor drive output. Speed control during CLV-P mode.
5	EFM	Input	EFM signal input from RF amp.
6	ASY	Output	Output for EFM signal slice level control.
7	MIRR	Input	MIRROR input from RF amplifier. Connects to GND.
8	VCOO	Output	VCO output. When EFM signal lock occurs, f=8.6436 MHz.
9	VCOI	Input	VCO input
10	TEST	Input	GND
11	PDO	Output	Phase comparison output of EFM signal and VCO/2.
12	VSS		GND
13	CLK	Input	PD8019E serial data transmission clock input. Latches data at the clock rise edge.
14	$\overline{XLT}$	Input	PD8019E latch input. Latches 8 bit shift register data (serial data from PD8019E) to each register.
15	DATA	Input	PD8019E serial data input.
16	$\overline{XRST}$	Input	System reset input. Reset with "L".
17	CNIN	Input	Tracking pulse input.
18	SENS	Output	Outputs internal status by address correspondence.
19	MUTG	Input	Muting input. When internal register ATTM is "L", MUTG is "L" which is a normal status. When "H", a silent status occurs.
20	CRCF	Output	Outputs the SUB-Q CRC result. (Not used)

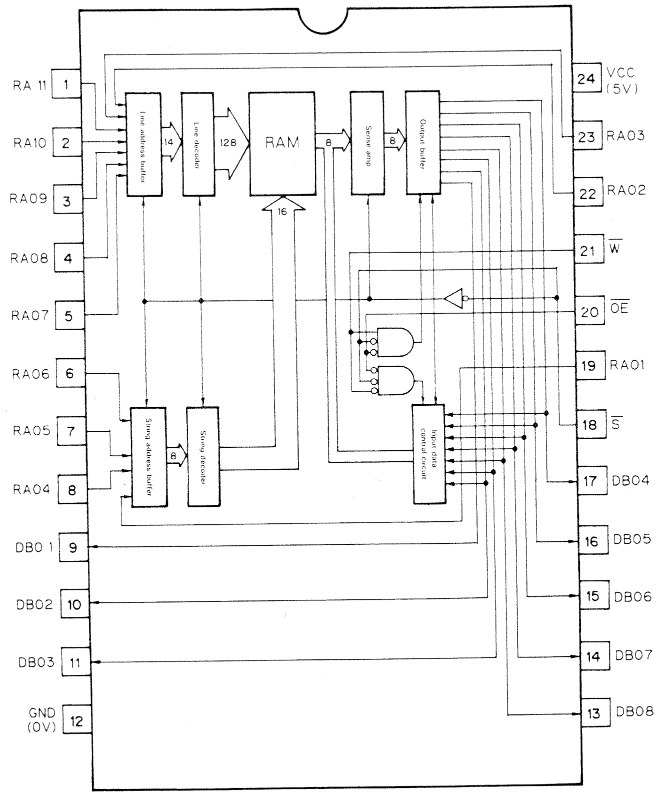
Pin No.	Pin name	I/O	Function and operation
21	EXCK	Input	Clock input for SUB-Q serial output. (Not used)
22	SBSO	Output	SUB-Q serial output. (Not used)
23	SUBQ	Output	SUB-Q output.
24	SCOR	Output	SUB-Q S0+S1 output.
25	WFCK	Output	Write Frame Clock output. When frame sync lock occurs, f = 7.35 kHz.
26	RFCK	Output	Read frame clock output. X'tal system 7.35 kHz.
27	GTOP	Output	Frame sync protective status display output. (Not used)
28	GFS	Output	Frame sync lock status display output.
29	DB08	I/O	External RAM data terminal. DATA 8 (MSB)
30	DB07	I/O	External RAM data terminal. DATA 7
31	DB06	I/O	External RAM data terminal. DATA 6
32	DB05	I/O	External RAM data terminal. DATA 5
33	VDD		Power supply terminal. +5V
34	DB04	I/O	External RAM data terminal. DATA 4
35	DB03	I/O	External RAM data terminal. DATA 3
36	DB02	I/O	External RAM data terminal. DATA 2
37	DB01	I/O	External RAM data terminal. DATA 1 (LSB)
38	RA01	Output	External RAM address output. ADDR01 (LSB)
39	RA02	Output	External RAM address output. ADDR02
40	RA03	Output	External RAM address output. ADDR03
41	RA04	Output	External RAM address output. ADDR04
42	RA05	Output	External RAM address output. ADDR05
43	RA06	Output	External RAM address output. ADDR06
44	RA07	Output	External RAM address output. ADDR07
45	RA08	Output	External RAM address output. ADDR08
46	RA09	Ouptu	External RAM address output. ADDR09
47	RA10	Output	External RAM address output. ADDR10
48	RA11	Output	External RAM address output. ADDR11 (MSB)
49	$\overline{\text{RAWE}}$	Output	Write enable signal output to external RAM. Active "L".
50	$\overline{\text{RACS}}$	Ouput	Chip select signal output to external RAM. Active "L".
51	C4M	Output	X'tal 1/2 frequency division output. f = 4.2336 MHz.
52	VSS		GND
53	XTAL	Input	X'tal oscillation circuit input. f = 8.4672 MHz.
54	XTAO	Output	X'tal oscillation circuit output. f = 8.4672 MHz.
55	C2FL	Output	Correction status output. When C2 system correction attempt is not successful, "H" occurs.
56	C2PO	Outout	C2 pointer display output. Synchronized to audio data output. (Not used.)
57	RAOV	Output	± 4 frame jitter extraction RAM overflow and underflow display output.
58	SLOB	Input	Audio data output code selection input. With "L", 2's complement output. With "H", offset binary output.
59	PSSL	Input	Audio data output mode selection input. With "L", serial output. With "H", parallel output. (This unit uses "L".)
60	APTR	Output	Aperture compensation control output. "H" during R ch. (Not used.)
61	APTL	Output	Aperture compensation control output. "H" during L ch. (Not used.)
62	DA01	Output	When PSSL = "H", DA01 (parallel audio data LSB) output. When PSSL = "L", CIF1 output.

Pin No.	Pin name	I/O	Function and operation
63	DA02	Output	When PSSL = "H", DA02 output. When PSSL = "L", C1F2 output.
64	DA03	Output	When PSSL = "H", DA03 output. When PSSL = "L", C2F1 output. (Not used.)
65	DA04	Output	When PSSL = "H", DA04 output. When PSSL = "L", C2F2 output. (Not used.)
66	DA05	Output	When PSSL = "H", DA05 output. When PSSL = "L", UFGS output. (Not used.)
67	DA06	Output	When PSSL = "H", DA06 output. When PSSL = "L", $\overline{\text{WFCK}}$ output. (Not used.)
68	DA07	Output	When PSSL = "H", DA07 output. When PSSL = "L", FCKV output. (Not used.)
69	DA08	Output	When PSSL = "H", DA08 output. When PSSL="L", FCKX output. (Not used.)
70	DA09	Output	When PSSL = "H", DA09 output. When PSSL = "L", $\overline{\text{PLCK}}$ output. (Not used.)
71	DA10	Output	When PSSL = "H", DA10 output. When PSSL = "L", $\overline{\text{LRCK}}$ output. (Not used.)
72	DA11	Output	When PSSL = "H", DA11 output. When PSSL = "L" C4LR output. (Not used.)
73	VDD		Power supply terminal. +5V
74	DA12	Output	When PSSL = "H", DA12 output. When PSSL = "L", $\overline{\text{DENL}}$ output. (Not used.)
75	DA13	Output	When PSSL = "H", DA13 output. When PSSL = "L", $\overline{\text{DENR}}$ outut. (Not used.)
76	DA14	Output	When PSSL = "H", DA14 output. When PSSL = "L", $\overline{\text{C210}}$ output.
77	DA15	Output	When PSSL = "H", DA15 output. When PSSL = "L", C210 output. (Not used.)
78	DA16	Output	When PSSL = "H", DA16 (parrallel audio MSB) output. When PSSL = "L", DATA output.
79	WDCK	Output	88.2 kHz strobe signal output
80	LRCK	Output	44.1 kHz strobe signal output

Notes:

C1F1:
C1F2: [C1 decode error correction status monitor output.]
C2F1:
C2F2: [C2 decode error correction status monitor output.]
UGFS: Unprotected frame sync pattern output.
$\overline{\text{WFCK}}$: WFCK invert output.
FCKV: WFCK/4 or WFCK/8 output.
FCKX: RFCK/4 or RFCK/8 output.
$\overline{\text{PLCK}}$: VCO/2 output. When locked to EFM signal, f = 4.3218 MHz.
C4LR: 176.4 kHz strobe signal
$\overline{\text{DENL}}$: L-ch serial data enable signal.
$\overline{\text{DENR}}$: R-ch serial data enable signal.
$\overline{\text{C210}}$: C210 invert output.
C210: Bit clock output. f = 2.1168 MHz.
DATA: Audio signal serial data output.

* IC202: M5M5117FP


RA 11
1
RA10
2
RA09
3
RA08
4
RA07
5
RA06
6
RA05
7
RA04
8
DB0 1
9
DB02
10
DB03
11
GND (0V)
12
24
VCC (5V)
23
RA03
22
RA02
21
W
20
OE
19
RA01
18
S
17
DB04
16
DB05
15
DB06
14
DB07
13
DB08
Line address buffer
14
Line decoder
128
RAM
8
Sense amp
8
Output buffer
16
String address buffer
8
String decoder
Input data control circuit

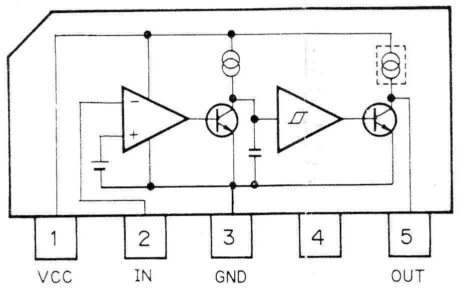
M5M5117FP Terminal Functions

RAM

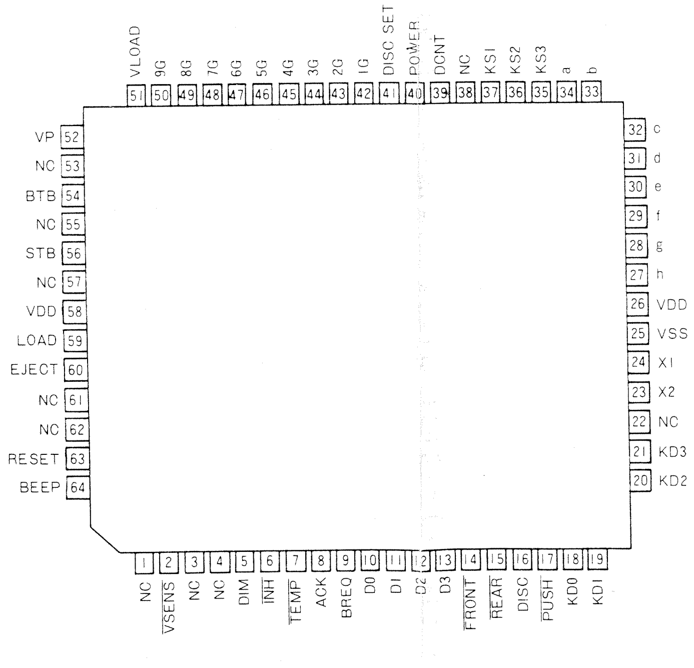
Pin No.	Pin name	I/O	Function and operation
1 – 8	RA11 – RA04	Input	Address input
9 – 11	DB01 – DB03	I/O	Data I/O
12	GND		0V
13 – 17	DB08 – DB04	I/O	Data I/O
18	$\overline{\text{S}}$	Input	Chip select input. "L" during write-in and read out.
19	A10	Input	Address input
20	$\overline{\text{OE}}$	Input	Output enable input. "L" during read out.
21	$\overline{\text{W}}$	Input	Write control input. "L" during wite-in, "H" during read out.
22, 23	RA02, RA03	Input	Address input.
24	Vcc		+5V

• Display Unit

IC702: M51956BL


1
2
3
4
5
VCC
IN
GND
OUT

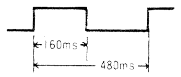
* IC701: PD4074D


VLOAD
9G
8G
7G
6G
5G
4G
3G
2G
1G
DISC SET
POWER
DCNT
NC
KS1
KS2
KS3
a
b
51
50
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
VP 52
NC 53
BTB 54
NC 55
STB 56
NC 57
VDD 58
LOAD 59
EJECT 60
NC 61
NC 62
RESET 63
BEEP 64
32 c
31 d
30 e
29 f
28 g
27 h
26 VDD
25 VSS
24 X1
23 X2
22 NC
21 KD3
20 KD2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
NC
VSENS
NC
NC
DIM
INH
TEMP
ACK
BREQ
D0
D1
D2
D3
FRONT
REAR
DISC
PUSH
KD0
KD1

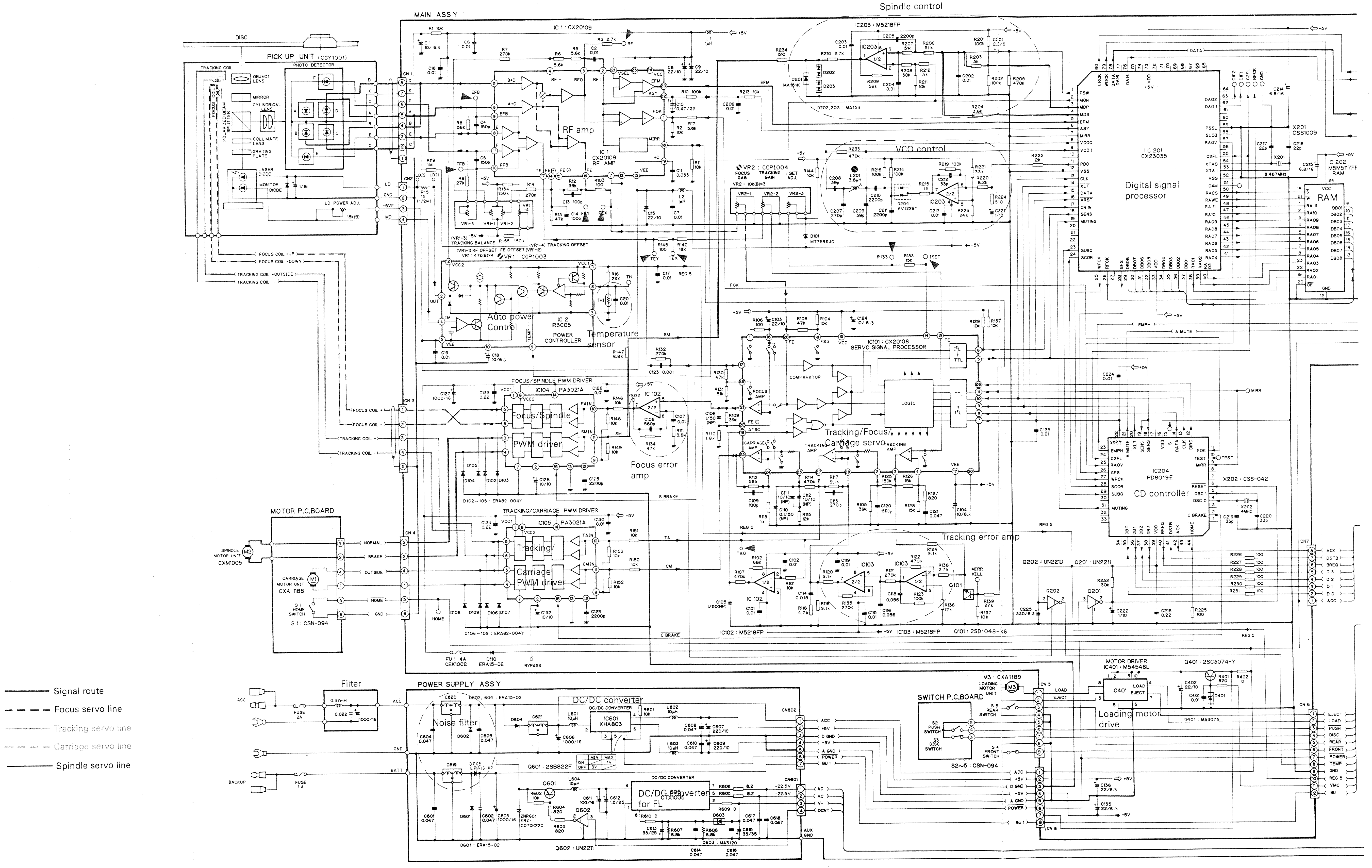
PD4074D Terminal Functions

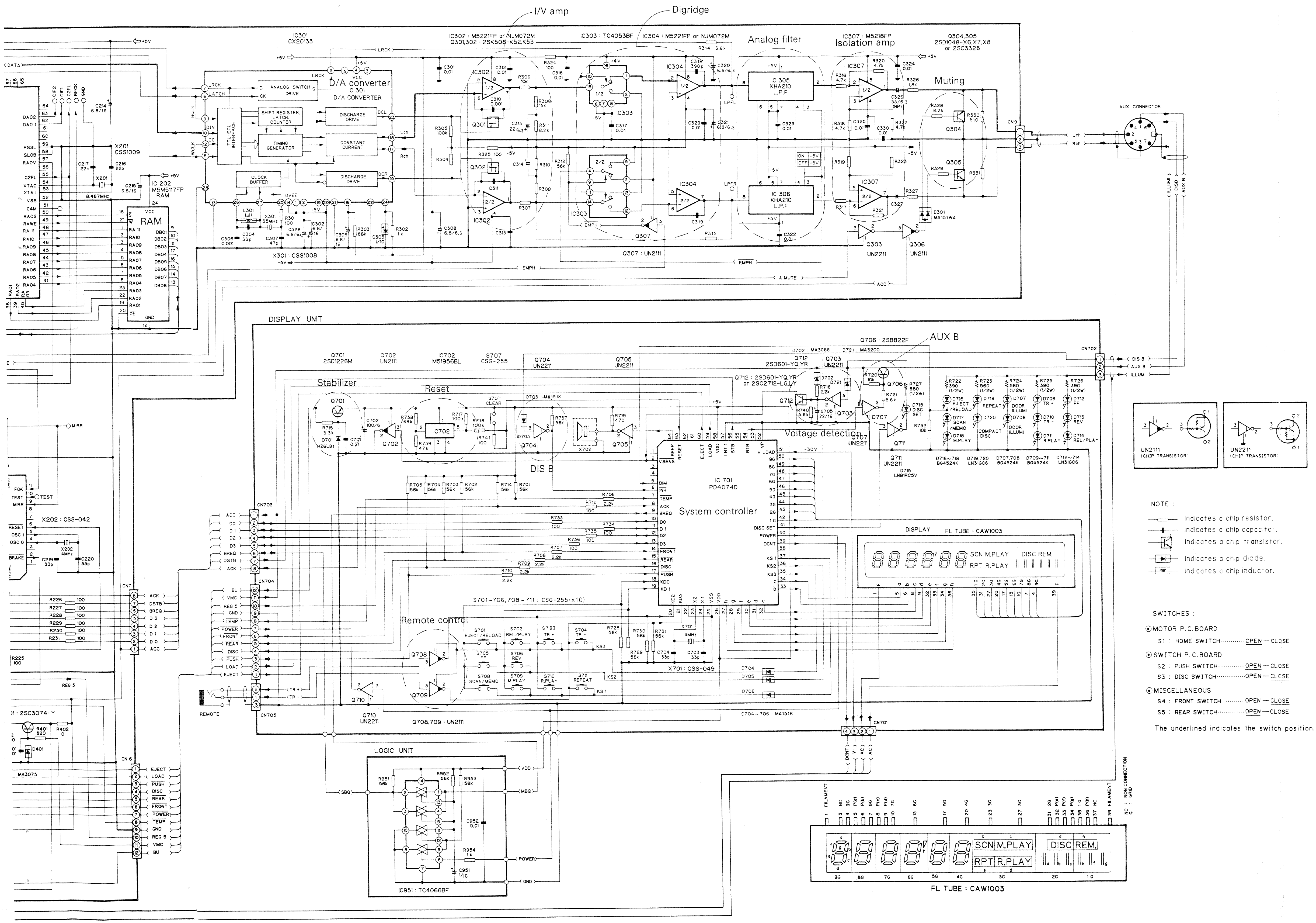
System controller

<table>
<tr><th>Pin No.</th><th>Pin name</th><th>I/O</th><th>Function and operation</th></tr>
<tr><td>1</td><td>NC</td><td></td><td></td></tr>
<tr><td>2</td><td>$\overline{\text{VSENS}}$</td><td>Input</td><td>ACC voltage detection circuit signal input terminal.
CMOS input. ACC ON: "L" ACC OFF: "H"</td></tr>
<tr><td>3</td><td>NC</td><td></td><td></td></tr>
<tr><td>4</td><td>NC</td><td></td><td></td></tr>
<tr><td>5</td><td>DIM</td><td>Input</td><td>Dimmer control input terminal. CMOS input.
Changes FL tube dynamic drive duty to perform.
"H": Dimmer ON "L": Dimmer OFF</td></tr>
<tr><td>6</td><td>$\overline{\text{INH}}$</td><td>Input</td><td>+B disable detection terminal. CMOS input. Operation stops with "L" to wait until "H" occurs.</td></tr>
<tr><td>7</td><td>$\overline{\text{TEMP}}$</td><td>Input</td><td>High temperature detection terminal. CMOS input.
With "L", a high temperature judgement is made to stop system operation.</td></tr>
<tr><td>8</td><td>ACK</td><td>Input</td><td>Communication control line
• Data link control
Communication mode is determined by the level of this signal.
• Handshake control
Communication direction (PD4074D → PD8019E)
Indicates that outputted data was accepted by PD8019E when this signal rises.
Communication direction (PD8019E → PD4074D)
Indicates that data outputted by PD8019E is effective when this signal breaks.</td></tr>
<tr><td>9</td><td>BREQ</td><td>I/O</td><td>Communication control line. CMOS I/O.
• Data link control
When "L" occurs by PD8019E, the communication mode is determined by the ACK level outputted by PD8019E.
<table>
<tr><th>ACK</th><th>Communication mode</th></tr>
<tr><td>"L"</td><td>Command send enable status for PD8019E.
When a command to be sent exists, a communication status occurs with STB "L".</td></tr>
<tr><td>"H"</td><td>Data send request status from PD8019E.
PD4074D must immediately accept the request with STB"L"</td></tr>
</table>
• Handshake control
When a data string is sent, "L" output occurs when the first data is sent and termination of the last data string is indicated by "H" when the last data is sent.</td></tr>
<tr><td>10 – 13</td><td>D0 – D3</td><td>I/O</td><td>Communication data bus. For CMOS I/O.</td></tr>
<tr><td>14</td><td>$\overline{\text{FRONT}}$</td><td>Input</td><td>FRONT switch detection terminal. CMOS input.
Terminal that detects if the plate unit (mechanism part) is at the front or not. (If it is at the front, it is "L"). Indicates eject completion.</td></tr>
<tr><td>15</td><td>$\overline{\text{REAR}}$</td><td>Input</td><td>REAR switch detection terminal. CMOS input.
Terminal that detects if the plate unit is at the back or not. ("L" if at the back.) Indicates loading completed.</td></tr>
<tr><td>16</td><td>DISC</td><td>Input</td><td>DISC switch detection terminal. CMOS input.
Terminal that detects if a disc is inserted or not. "H" if a disc is present.</td></tr>
<tr><td>17</td><td>$\overline{\text{PUSH}}$</td><td>Input</td><td>PUSH switch detection terminal. CMOS input.
Terminal that detects if an inserted disc is pressed ro not. "L" if pressed.</td></tr>
<tr><td>18</td><td>KD0</td><td>Input</td><td rowspan="4">KEY input terminal by matrix with KS3–KS1. CMOS input.
<table>
<tr><th></th><th>KS3</th><th>KS2</th><th>KSI</th></tr>
<tr><td>KD0</td><td>EJECT</td><td>FF</td><td>SCAN</td></tr>
<tr><td>KDI</td><td>REL/PLAY</td><td>REV</td><td>M·PLAY</td></tr>
<tr><td>KD2</td><td>TR+</td><td>/</td><td>R·PLAY</td></tr>
<tr><td>KD3</td><td>TR–</td><td>/</td><td>RPT</td></tr>
</table></td></tr>
<tr><td>19</td><td>KD1</td><td>Input</td></tr>
<tr><td>20</td><td>KD2</td><td>Input</td></tr>
<tr><td>21</td><td>KD3</td><td>Input</td></tr>
</table>

Pin No.	Pin name	I/O	Function and operation
22	NC		GND
23	X2		Clock oscillation terminal. 4 MHz
24	X1		Clock oscillation terminal.
25	Vss		GND
26	VDD		Power supply terminal. +5V
27	h	Output	
28	g	Output	FL anode output. P-ch open drain with pull down.
29	f	Output	
30	e	Output	
31	d	Output	
32	c	Output	
33	b	Output	
34	a	Output	
35	KS3	Output	Strobe output for key scan. P-ch open drain no pull down.
36	KS2	Output	
37	KS1	Output	
38	NC		
39	DCNT	Output	FL display DC/DC converter control terminal. P-ch open drain no pull down. Power is supplied to the DC/DC converter with "H".
40	POWER	Output	Servo system DC/DC converter control terminal. P-ch open drain no pull down. With "H", PD8019D reset start, DC/DC converter ON.
41	DISC SET	Output	LED (DISC SET) control terminal During disc loading: FIGURE Disc set: "H" 
42 – 50	1G – 9G	Output	FL grid output. P-ch open drain with pull down.
51	VLOAD	Input	FL driver power supply. –30V
52	VP	Input	FL driver power supply. Connects to GND.
53	NC		
54	BTB	Output	AUX B output terminal. CMOS output. With "H", +B output from AUX connecter.
55	NC		
56	STB	Output	Communication control line. CMOS output. • Data link control Outputs "H" for a data send request from PD8019E to notify data send request acceptance. • Handshake control Communication direction (PD4074D → PD8019E) Outputs "L" to indicate that ouptut data is effective for PD8019E. Communication direction (PD8019E → PD4074D) Outputs "H" to indicate that data output from PD8019E was accepted.
57	NC		GND
58	VDD		Power supply terminal. +5V
59	LOAD	Output	Disc load control terminal. CMOS output. LOAD with "H".
60	EJECT	Output	Disc Eject control terminal. CMOS output. EJECT with "H".
61	NC		
62	NC		
63	RESET	Input	Reset terminal. CMOS input. "H": Reset ON' "L": Reset OFF
64	BEEP	Output	Buzzer output terminal. CMOS output.

11. SCHEMATIC CIRCUIT DIAGRAM


MAIN ASSY
DISC
PICK UP UNIT (CGY1001)
PHOTO DETECTOR
TRACKING COIL
FOCUS COIL
OBJECT LENS
MIRROR
CYLINDRICAL LENS
POLARIZED BEAM SPLITTER
COLLIMATE LENS
GRATING PLATE
LASER DIODE
MONITOR DIODE
LD POWER ADJ.
IC 1 : CX20109
IC 1 CX20109 RF AMP
RF amp
Spindle control
IC203 : M5218FP
VCO control
VR2 : CCP1004
FOCUS GAIN
TRACKING GAIN
I SET ADJ.
TRACKING BALANCE
RF OFFSET
FE OFFSET
TRACKING OFFSET
VR1 : CCP1003
IC 2 IR3C05
POWER CONTROLLER
Auto power Control
Temperature sensor
IC 201 CX23035
Digital signal processor
IC 202 M5M5117FP RAM
RAM
X201 CSS1009
8.467MHz
IC101 : CX20108
SERVO SIGNAL PROCESSOR
COMPARATOR
LOGIC
FOCUS AMP
Tracking/Focus/Carriage servo
FOCUS/SPINDLE PWM DRIVER
IC104 PA3021A
Focus/Spindle PWM driver
IC 102
Focus error amp
TRACKING/CARRIAGE PWM DRIVER
IC105 PA3021A
Tracking/ Carriage PWM driver
Tracking error amp
IC102 : M5218FP
IC103 : M5218FP
Q101 : 2SD1048-X6
IC204 PD8019E
CD controller
X202 : CSS-042
Q202 : UN221D
Q201 : UN2211
MOTOR P.C.BOARD
SPINDLE MOTOR UNIT CXM1005
CARRIAGE MOTOR UNIT CXA 1188
S1 HOME SWITCH
S1 : CSN-094
NORMAL
BRAKE
OUTSIDE
HOME
GND
FU 1 4A CEK1002
D110 ERA15-02
BYPASS
Filter
ACC
FUSE 2A
GND
BATT
BACKUP
FUSE 1A
POWER SUPPLY ASSY
Noise filter
DC/DC converter
IC601 KHA803
DC/DC converter for FL
CTX1005
Q601 : 2SB822F
Q602 : UN2211
D601 : ERA15-02
D603 : MA3120
SWITCH P.C.BOARD
M3 : CXA1189
LOADING MOTOR UNIT
S2 PUSH SWITCH
S3 DISC SWITCH
S4 FRONT SWITCH
S5 REAR SWITCH
S2~5 : CSN-094
MOTOR DRIVER IC401 : M54546L
Loading motor drive
Q401 : 2SC3074-Y
D401 : MA3075
EJECT
LOAD
PUSH
DISC
REAR
FRONT
POWER
TEMP
REG 5
VMC
BU
Signal route
Focus servo line
Tracking servo line
Carriage servo line
Spindle servo line
A
B
C
D
1
2
3
4
5
6


I/V amp
Digridge
IC301 CX20133
D/A converter
IC 301 D/A CONVERTER
IC302 : M5221FP or NJM072M
Q301,302 : 2SK508-K52,K53
IC303 : TC4053BF
IC304 : M5221FP or NJM072M
Analog filter
IC 305 KHA210 L.P.F
IC 306 KHA210 L.P.F
IC307 : M5218FP
Isolation amp
Q304,305 2SD1048-X6,X7,X8 or 2SC3326
Muting
D301 MA151WA
Q303 UN2211
Q306 UN2211
Q307 : UN2111
X301 : CSS1008
X201 CSS1009
IC 202 M5M5117FP RAM
CN9
Lch
Rch
AUX CONNECTOR
DIS B
AUX B
ILLUMI
DISPLAY UNIT
Q701 2SD1226M
Q702 UN2111
IC702 M51956BL
S707 CSG-255
Q704 UN2211
Q705 UN2211
Q706 : 2SB822F
AUX B
Q712 : 2SD601-YQ,YR or 2SC2712-LG,LY
Q703 UN2211
Stabilizer
Reset
DIS B
Voltage detection
Q707 UN2211
Q711 UN2211
D715 LN81RC5V
IC 701 PD4074D
System controller
DISPLAY FL TUBE : CAW1003
SCN M.PLAY RPT R.PLAY DISC REM.
S701~706, 708~711 : CSG-255(x10)
Remote control
X701 : CSS-049
Q710 UN2211
Q708,709 : UN2111
D704~706 : MA151K
REMOTE
CN703
CN704
CN705
CN702
CN701
CN7
CN 6
LOGIC UNIT
IC951 : TC4066BF
FL TUBE : CAW1003
NC : NON CONNECTION
G : GRID
UN2111 (CHIP TRANSISTOR)
UN2211 (CHIP TRANSISTOR)

NOTE :

Indicates a chip resistor.

Indicates a chip capacitor.

Indicates a chip transistor.

Indicates a chip diode.

Indicates a chip inductor.

SWITCHES :

⦿MOTOR P.C.BOARD

S1 : HOME SWITCH………… OPEN — CLOSE

⦿SWITCH P.C.BOARD

S2 : PUSH SWITCH………… OPEN — CLOSE

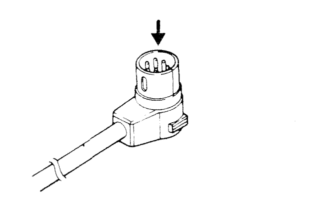
S3 : DISC SWITCH………… OPEN — CLOSE

⦿MISCELLANEOUS

S4 : FRONT SWITCH………… OPEN — CLOSE

S5 : REAR SWITCH………… OPEN — CLOSE

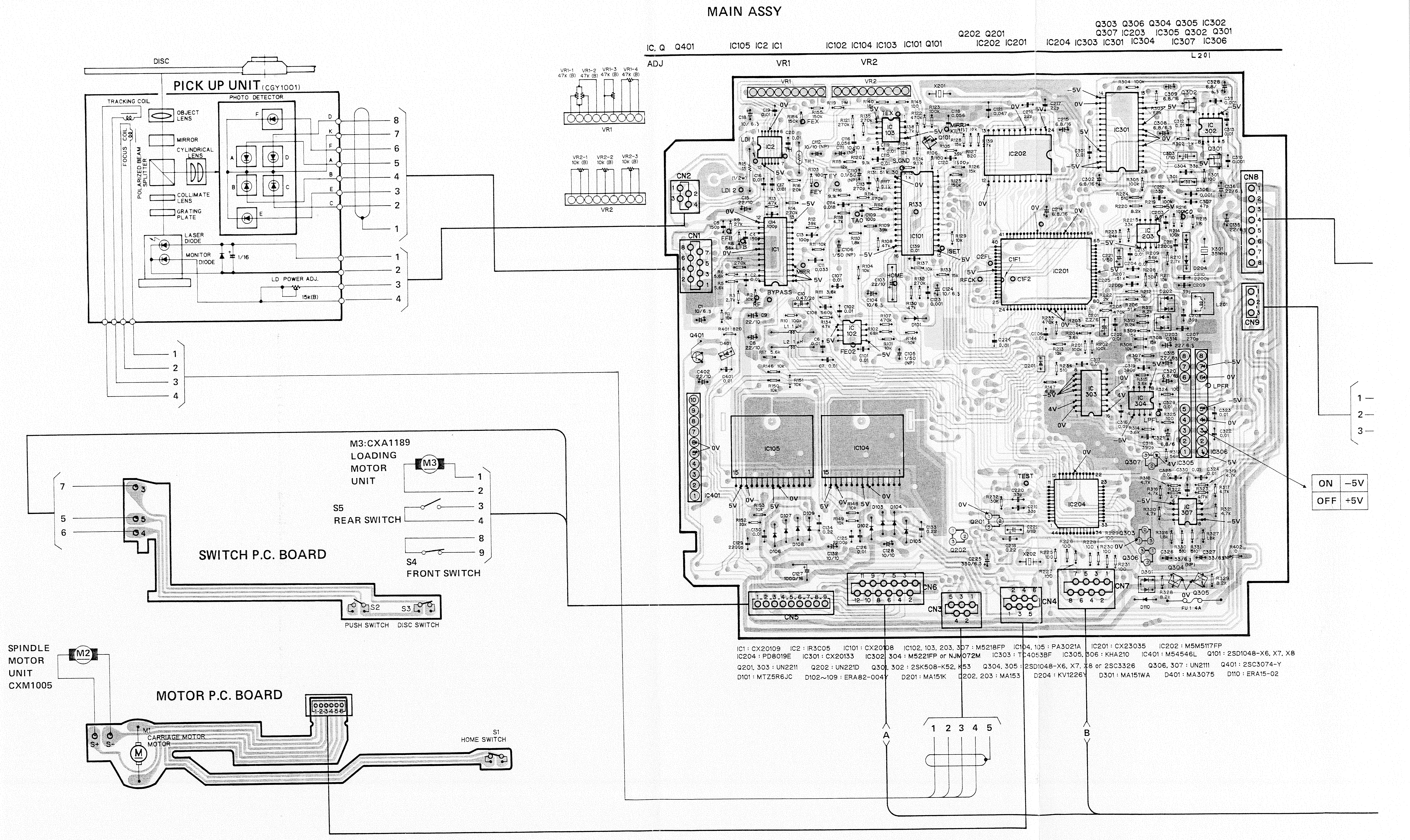
The underlined indicates the switch position.



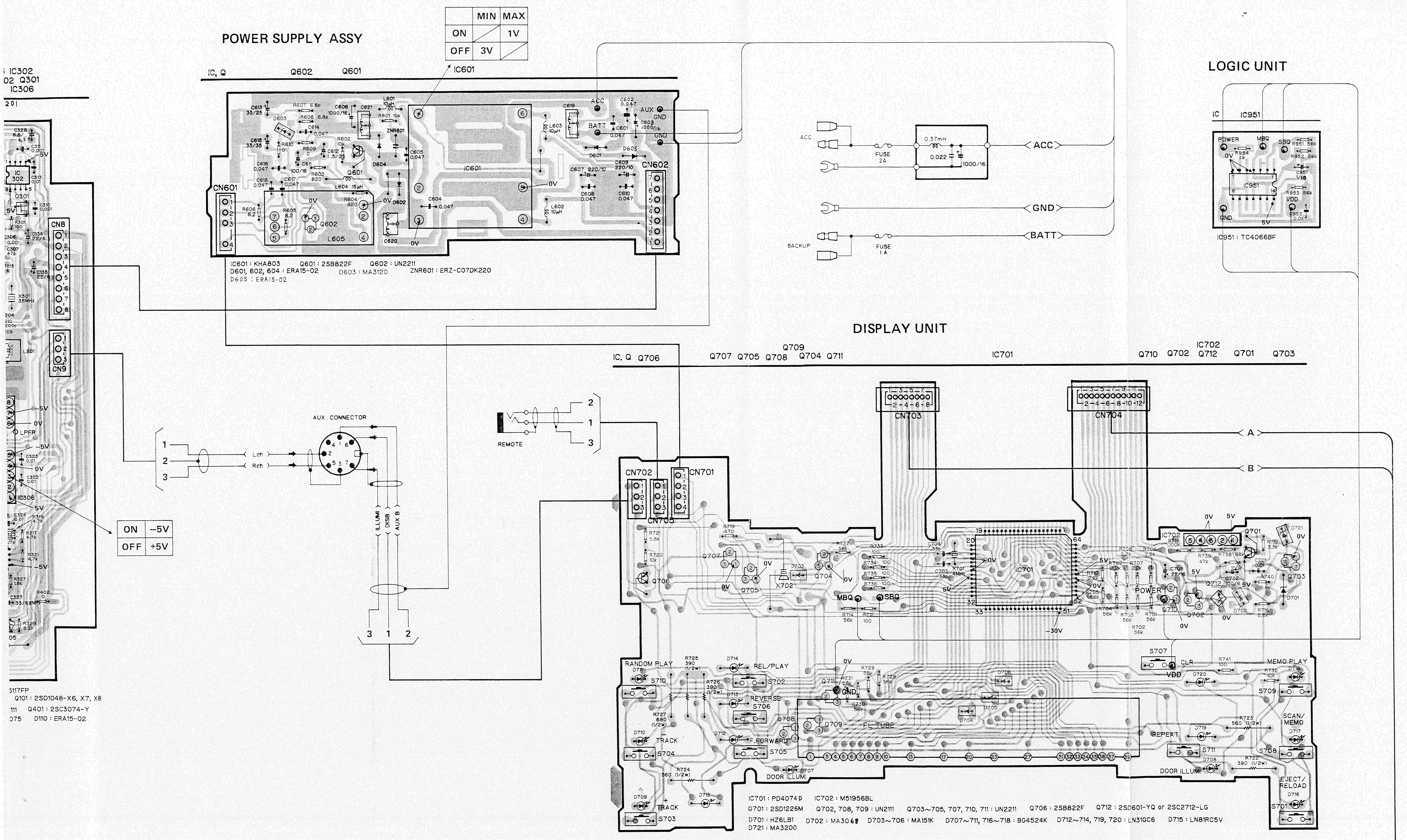
Note:
Connector is viewed from
the direction of the arrow.

Fig. 46

12. CONNECTION DIAGRAM


MAIN ASSY
IC, Q Q401 IC105 IC2 IC1 IC102 IC104 IC103 IC101 Q101 Q202 Q201 IC202 IC201 IC204 IC303 IC301 Q303 Q306 Q304 Q305 IC302 Q307 IC203 IC305 Q302 Q301 IC304 IC307 IC306
ADJ VR1 VR2 L201
DISC
PICK UP UNIT (CGY1001)
TRACKING COIL
FOCUS COIL
OBJECT LENS
MIRROR
CYLINDRICAL LENS
POLARIZED BEAM SPLITTER
COLLIMATE LENS
GRATING PLATE
PHOTO DETECTOR
LASER DIODE
MONITOR DIODE
LD POWER ADJ.
15k(B)
VR1-1 47k (B) VR1-2 47k (B) VR1-3 47k (B) VR1-4 47k (B)
VR1
VR2-1 10k (B) VR2-2 10k (B) VR2-3 10k (B)
VR2
M3:CXA1189 LOADING MOTOR UNIT
S5 REAR SWITCH
S4 FRONT SWITCH
SWITCH P.C. BOARD
PUSH SWITCH DISC SWITCH
S2 S3
SPINDLE MOTOR UNIT CXM1005
M2
MOTOR P.C. BOARD
CARRIAGE MOTOR
HOME SWITCH
S1
CN1 CN2 CN3 CN4 CN5 CN6 CN7 CN8 CN9
ON -5V
OFF +5V
A B
FU1 4A

IC1 : CX20109 IC2 : IR3C05 IC101 : CX20108 IC102, 103, 203, 307 : M5218FP IC104, 105 : PA3021A IC201 : CX23035 IC202 : M5M5117FP
IC204 : PD8019E IC301 : CX20133 IC302, 304 : M5221FP or NJM072M IC303 : TC4053BF IC305, 306 : KHA210 IC401 : M54546L Q101 : 2SD1048-X6, X7, X8
Q201, 303 : UN2211 Q202 : UN221D Q301, 302 : 2SK508-K52, K53 Q304, 305 : 2SD1048-X6, X7, X8 or 2SC3326 Q306, 307 : UN2111 Q401 : 2SC3074-Y
D101 : MTZ5R6JC D102~109 : ERA82-004Y D201 : MA151K D202, 203 : MA153 D204 : KV1226Y D301 : MA151WA D401 : MA3075 D110 : ERA15-02


POWER SUPPLY ASSY
MIN MAX
ON 1V
OFF 3V
IC, Q Q602 Q601
IC601
CN601
CN602
ACC
BATT
AUX
GND
L605
Q602
Q601
CN8
CN9
ON –5V
OFF +5V
AUX CONNECTOR
Lch
Rch
ILLUMI
DISB
AUX B
REMOTE
ACC
FUSE 2A
0.37mH
0.022
1000/16
GND
BATT
BACKUP
FUSE 1A
LOGIC UNIT
IC IC951
POWER
MBQ
SBQ
VDD
5V
0V
DISPLAY UNIT
IC, Q Q706 Q707 Q705 Q708 Q709 Q704 Q711 IC701 Q710 Q702 IC702 Q712 Q701 Q703
CN703
CN704
CN702
CN701
CN705
A
B
RANDOM PLAY
REL/PLAY
REVERSE
TRACK
F.FORWARD
DOOR ILLUMI
FL TUBE
CLR
MEMO PLAY
SCAN/MEMO
REPEAT
EJECT/RELOAD
–30V
S701 S702 S703 S704 S705 S706 S707 S708 S709 S710 S711

IC601 : KHA803 Q601 : 2SB822F Q602 : UN2211
D601, 602, 604 : ERA15-02 D603 : MA3120 ZNR601 : ERZ-C07DK220
D605 : ERA15-02

IC951 : TC4066BF

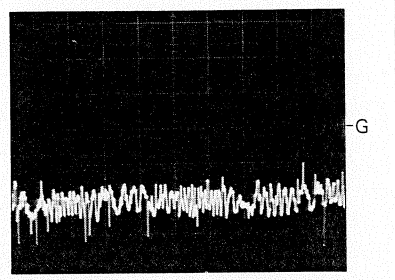
5117FP
Q101 : 2SD1048-X6, X7, X8
:111 Q401 : 2SC3074-Y
075 D110 : ERA15-02

IC701 : PD4074D IC702 : M51956BL
Q701 : 2SD1226M Q702, 708, 709 : UN2111 Q703～705, 707, 710, 711 : UN2211 Q706 : 2SB822F Q712 : 2SD601-YQ or 2SC2712-LG
D701 : HZ6LB1 D702 : MA3068 D703～706 : MA151K D707～711, 716～718 : BG4524K D712～714, 719, 720 : LN31GC6 D715 : LN81RC5V
D721 : MA3200

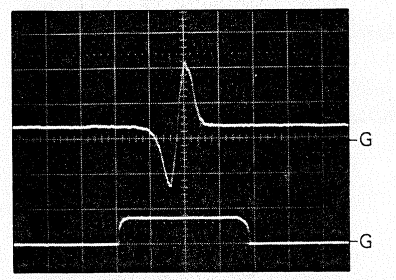
Fig. 47

- **Waveforms**

EFB Test mode : Tracking open
V : 100mV/div. H : 5ms/div.

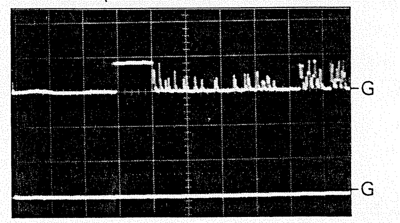


CH1 : FEVO V : 500mV/div. H : 5ms/div.
CH2 : FOK1 V : 5V/div. H : 5ms/div.
Test mode : Connect the FOK terminal to GND. Focus search is performed.
The lens moves DOWN → UP.

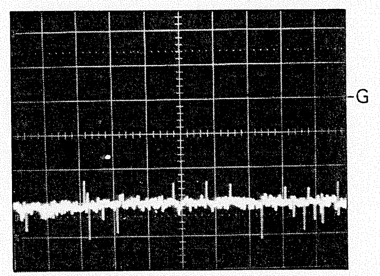


(Disc inserted)

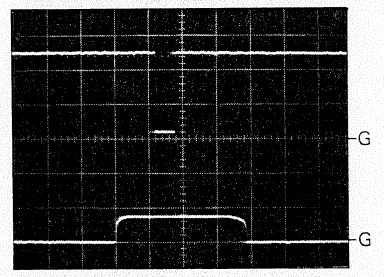
MON GND
CH1 : Pin 1 of IC203
V : 5V/div. H : 0.5s/div.
CH2 : MON
V : 5V/div. H : 0.5s/div.
Test mode : MON terminal connected to GND and TRCK – button depressed (when in focus).



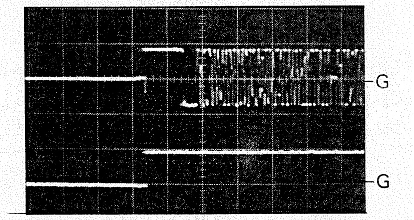
EFB Test mode : Tracking close
V : 100mV/div. H : 5ms/div.



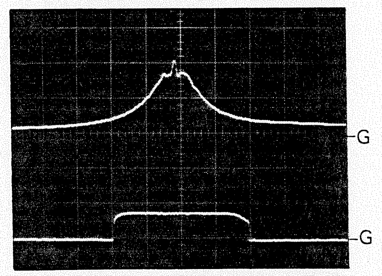
CH1 : SENS V : 2V/div. H : 5ms/div.
CH2 : FOK1 V : 5V/div. H : 5ms/div.
Test mode : Connect the FOK terminal to GND. Focus search is performed. (Disc inserted)



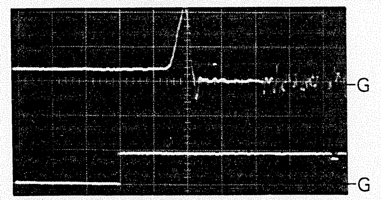
MON Open
CH1 : Pin 1 of IC203
V : 5V/div. H : 0.5s/div.
CH2 : MON
V : 5V/div. H : 0.5s/div.
Test mode : The MON terminal disconnected and the TRCK – button depressed (when in focus).



CH1 : RF V : 1V/div. H : 5ms/div.
CH2 : FOK1 V : 5V/div. H : 5ms/div.
Test mode : Connect the FOK terminal to GND. Focus search is performed. (Disc inserted)

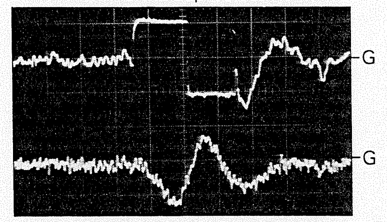


When in focus
CH1 : FEVO V : 500mV/div. H : 5ms/div.
CH2 : FOK1 V : 5V/div. H : 5ms/div.
Test mode : FOK terminal connected to GND while performing focus search, after which the FOK terminal is disconnected. The photo shows the lens moving UP → DOWN until it focuses.

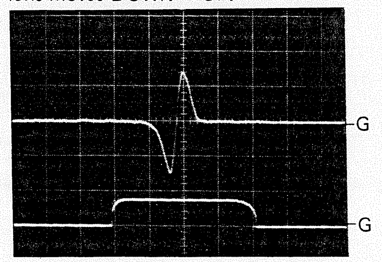


(Disc inserted)

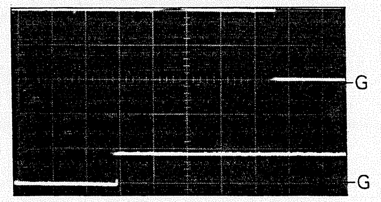
Jump (FF)
CH1 : TAO V : 500mV/div. H : 0.2ms/div.
CH2 : TEY V : 1V/div. H : 0.2ms/div.
Test mode : Press the TRCK– and SCAN buttons. After PLAY, press the FF or REV button. The photo shows condition when the FF button is depressed.



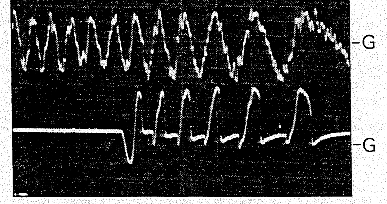
CH1 : FEY V : 2V/div. H : 5ms/div.
CH2 : FOK1 V : 5V/div. H : 5ms/div.
Test mode : Connect the FOK terminal to GND. Focus search is performed. (Disc inserted)
The lens moves DOWN → UP.



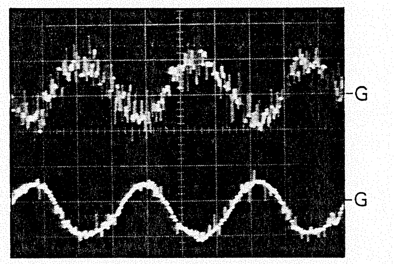
When in focus
CH1 : FS3 V : 2V/div. H : 5ms/div.
CH2 : FOK1 V : 5V/div. H : 5ms/div.
Test mode : FOK terminal connected to GND while performing focus search, after which the FOK terminal is disconnected, and the focus point is found. (Disc inserted)



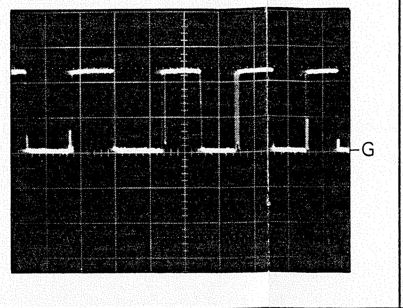
Tracking close
CH1 : TEY V : 1V/div. H : 0.2ms/div.
CH2 : TAO V : 1V/div. H : 0.2ms/div.
Normal mode : Waveform with the TRCK button depressed while carriage move to tracking servo closed condition.



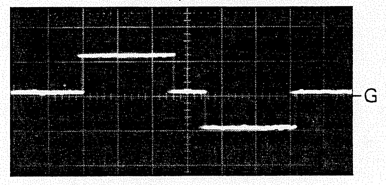
CH1 : TAO
V : 200mV/div. H : 50ms/div.
CH2 : Pin 7 of IC103
V : 200mV/div. H : 50ms/div.
Test mode : JUMP (Press the FF, REV button)



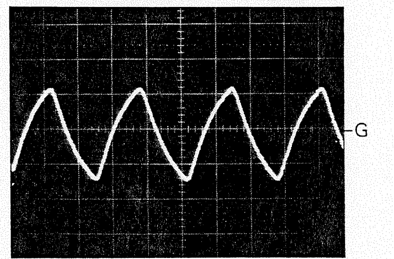
MIRR Tracking open
V : 2V/div. H : 0.5ms/div.
Test mode : Tracking open (TRCK – button depressed)



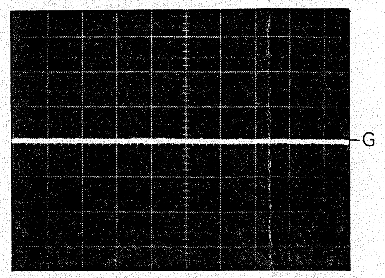
TAO Tracking actuator kick
V : 500mV/div. H : 0.5s/div.
Test mode : Condition when the REPEAT button is depressed and after which the FF or REV button is depressed. Photo shows condition when the FF button (lens outer range) and the REV button depressed.



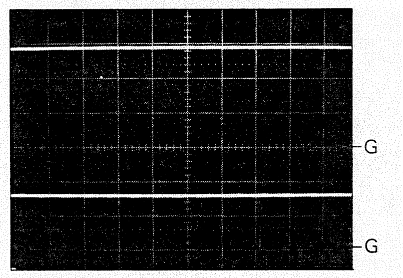
FEO2 Search
V : 1V/div. H : 0.5s/div.
Test mode : Waveform of FEO2 terminal during focus search with the FOK terminal connected to GND.



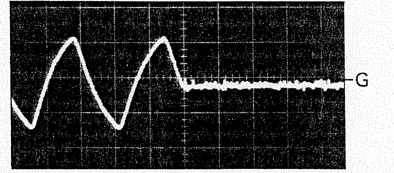
MIRR Tracking closed
V : 2V/div. H : 0.5ms/div.
Test mode : Tracking closed (TRCK – and SCAN button depressed).



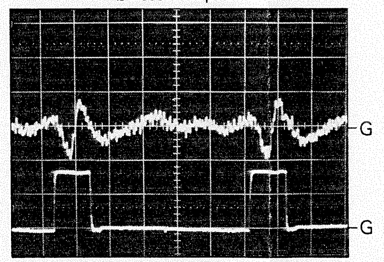
CH1 : VCC (14.4V)
V : 5V/div. H : 0.5s/div.
CH2 : BYPASS (8V)
V : 5V/div. H : 0.5s/div.
Test mode : DD converter set to ON.



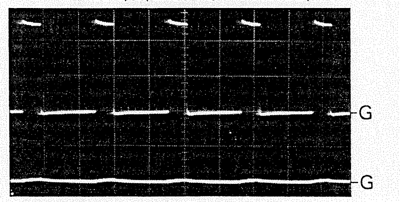
FEO2 when in focus
V : 1V/div. H : 0.5s/div.
Test mode : FOK terminal connected to GND while performing focus search, after which the FOK terminal is disconnected and the point of focus is found. The photo shows the lens moving DOWN → UP when in focus.



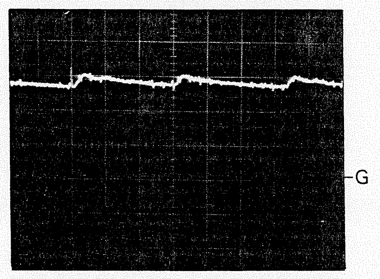
SLO Jump (FF)
CH1 : TE V : 1V/div. H : 0.5ms/div.
CH2 : SLO V : 2V/div. H : 0.5ms/div.
Test mode : Jump (FF, REV button) photo shows condition with FF button depressed.



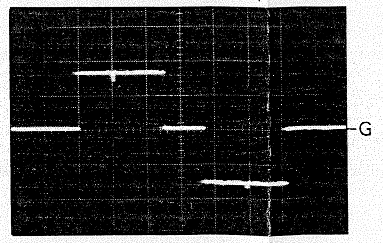
CH1 : TA +
V : 5V/div. H : 10μs/div.
CH2 : TA –
V : 5V/div. H : 10μs/div.
Test mode : Condition when the REPEAT button is depressed, after which the FF button is depressed (tracking actuator kick). (Disc not inserted)



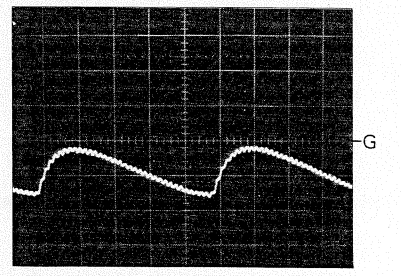
HC Search
V : 500mV/div. H : 0.2ms/div.
Normal mode : Waveform of HC terminal during search with TRCK button depressed.



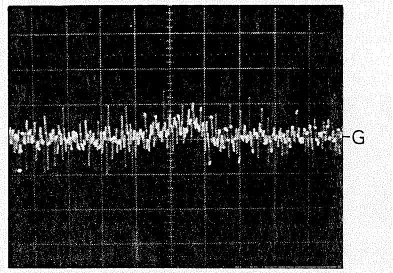
SLO Carriage (+) (–)
V : 2V/div. H : 0.5s/div.
Test mode : Carriage moved by pressing the FF or REV button. Photo first shows condition with the FF button and then the REV button depressed.



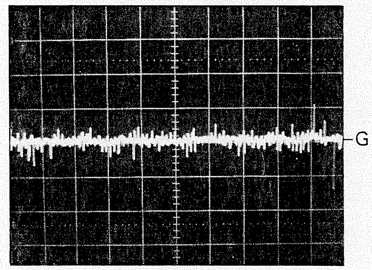
ATSC
V : 500mV/div. H : 1s/div.
Normal mode : ATSC waveform during normal playing.



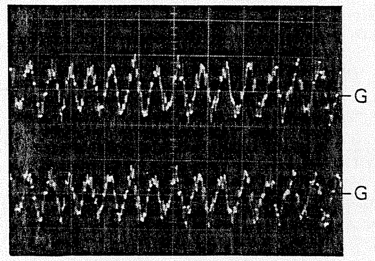
Plus (+) side of C110
V : 2mV/div. H : 0.5s/div.
Normal mode : Waveform of IC101 pin 25 during normal playing.



Q101 emitter side during search
V : 100mV/div. H : 0.5ms/div.
Normal mode : Waveform of Q101 emitter when the TRCK button is depressed during search.



TZC Search
CH1 : TE V : 1V/div. H : 0.2ms/div.
CH2 : TZC V : 1V/div. H : 0.2ms/div.
Normal mode : Waveform when the TRCK button is depressed during search.



13. CHASSIS EXPLODED VIEW

NOTE:

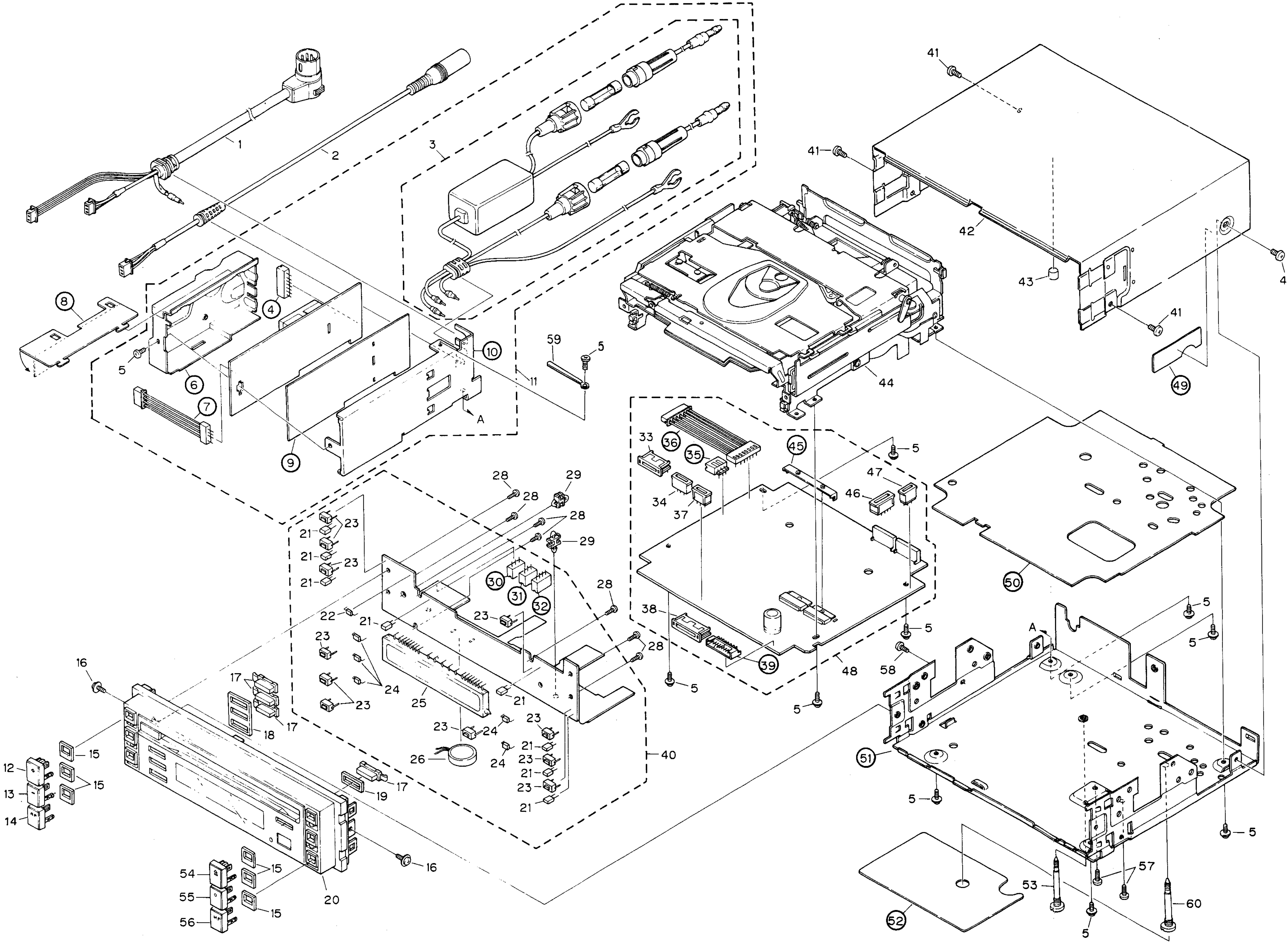
- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★: GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts whose parts numbers are omitted are subject to being not supplied.*
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

● Parts List

Mark	No.	Part No.	Description
	1.	CDK-403	DIN Cord
	2.	CDE1161	Cord
	3.	CDK-402	Cord
	4.		Plug
	5.	PMS26P040FMC	Screw
	6.		Shield Case
	7.		Connector
	8.		Clamper
	9.		Insulator
	10.		Shield Case
◉	11.	CWR1001	Power Supply Assy
★	12.	CAE-246	Button (TR+)
★	13.	CAE-247	Button (TR−)
★	14.	CAE-248	Button (R·PLAY)
	15.	CNM1100	Cushion
	16.	PMS30P050FMC	Screw
★	17.	CAC1081	Button
	18.	CNM1101	Cushion
	19.	CNM1102	Cushion
	20.	CXA1506	Grille Unit
★	21.	BG4524K	LED
★	22.	LN81RC5V	LED
★★	23.	CSG-255	Switch
★	24.	LN31GC6	LED
	25.	CAW1003	FL Tube
	26.	CPV1005	Buzzer
	27.	VACANT	
	28.	BPZ20P060FMC	Screw
	29.	CNV1154	Holder
	30.		Plug
	31.		Plug
	32.		Plug
	33.	CKS1063	Connector
	34.	CKS-721	Connector
	35.		Plug
	36.		Connector
	37.	CKS-720	Connector
	38.	CKS1122	Connector
	39.		Plug
◉	40.	CWX1020	Display Unit
	41.	CBA-178	Screw
	42.	CNB1049	Case
	43.	CNM1166	Cushion
◉	44.	CXK2010	CD Mechanism Unit
	45.		Bracket
	46.	CKS1070	Connector
	47.	CKS-719	Connector
◉	48.	CWX1019	Main Assy
	49.		Insulator
	50.		Insulator
	51.		Chassis
	52.		Seal
	53.	CBA1019	Screw
★	54.	CAE-243	Button (EJECT)
★	55.	CAE-244	Button (SCAN)
★	56.	CAE-245	Button (M·PLAY)
	57.	BMZ26P060FMC	Screw
	58.	CMZ26P040FMC	Screw
	59.	CEF-007	Clamper
	60.	CBA1049	Screw

Note:
*Two screws labeled 53 and 60 are attached to the back of the set to protect it in transit. If the set is shipped (i.e., for repairs), be sure to protect your set by re-attaching these screws.

- **Chassis**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D
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(6)
(7)
(8)
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(39)
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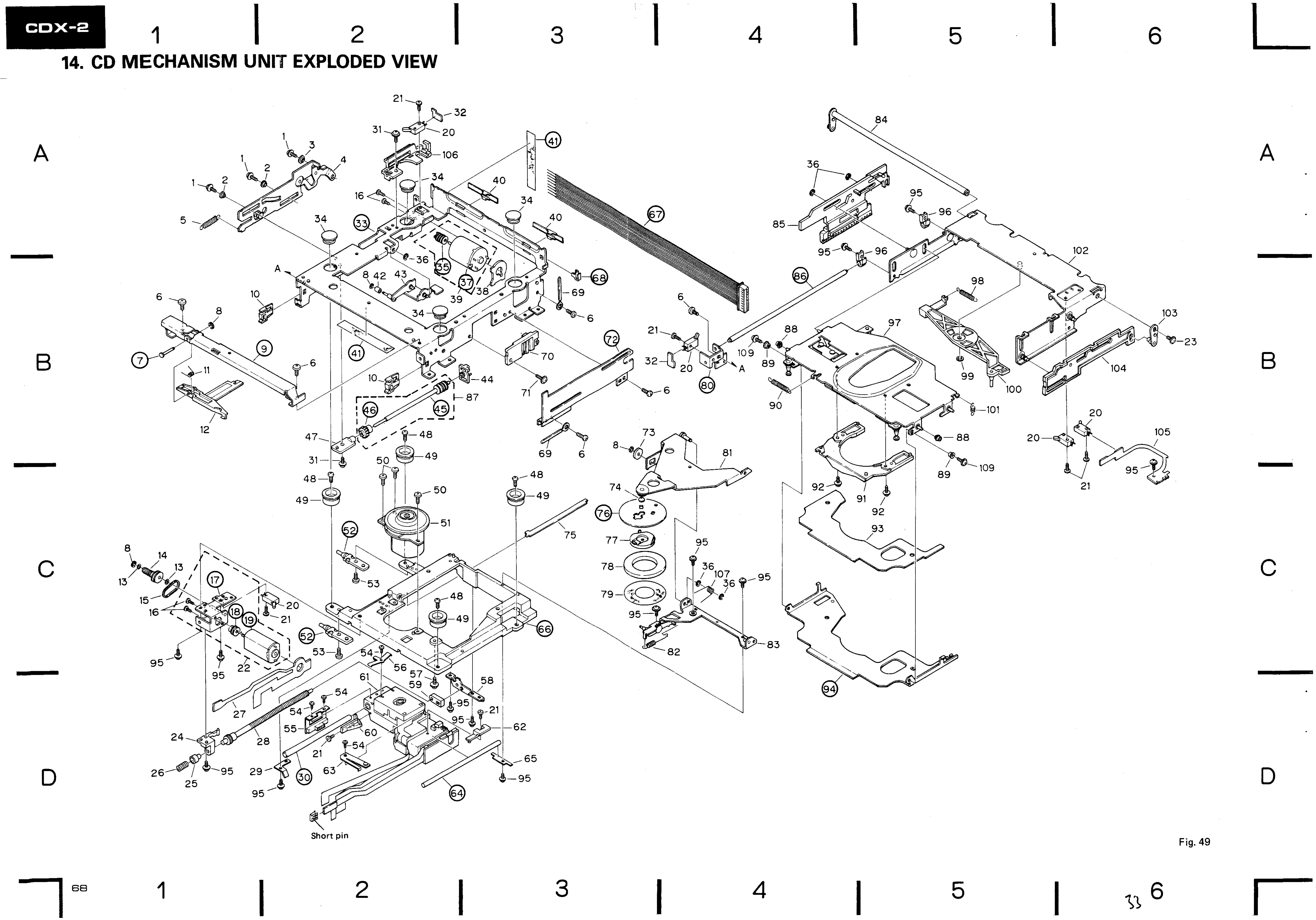
Fig. 48

14. CD MECHANISM UNIT EXPLODED VIEW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Short pin

Fig. 49

• Parts List

Mark	No.	Part No.	Description
	1.	PMS20P040FMC	Screw
	2.	CLA1102	Collar
	3.	CLA1037	Collar
	4.	CXA1057	Lever Unit
	5.	CBH1024	Spring
	6.	BMZ26P040FMC	Screw
	7.		Shaft
	8.	YE12FUC	Washer
	9.		Bracket
	10.	CNV1080	Clamper
	11.	CBH1025	Spring
	12.	CNV1130	Arm
	13.	HBF-117	Washer
	14.	CNV1205	Gear
★★	15.	CNT-114	Belt
	16.	HBA-175	Screw
	17.		Bracket Unit
	18.		Pulley
	19.		Motor
★★	20.	CSN-094	Switch
	21.	CBA1025	Screw
★★	22.	CXA1188	Motor Unit (Carriage)
	23.	PMS20P040FMC	Screw
	24.	CNV1054	Holder
	25.	CNV1058	Spacer
	26.	CBH1008	Spring
	27.	CNP1201	P.C. Board
	28.	CXA1056	Gear Unit
	29.	CNC1067	Holder
	30.		Shaft
	31.	PMS26P040FUC	Screw
	32.	CNP1200	P.C. Board
	33.		Chassis
	34.	CNV1199	Spacer
	35.		Gear
	36.	YE15FUC	Washer
	37.		Motor
	38.	CNP1199	P.C. Board
★★	39.	CXA1189	Motor Unit (Loading)
	40.	CNV1203	Clamper
	41.		Cover
	42.	CLA1069	Roller
	43.	CXA1061	Arm Unit
	44.	CNV1070	Guide
	45.		Shaft
	46.		Gear
	47.	CNV1069	Guide
	48.	CBA-182	Screw
	49.	CNV1078	Bush
	50.	CBA1013	Screw
★★	51.	CXM1005	Motor Unit (Spindle)
	52.		Shaft
	53.	CBA-182	Screw
	54.	HBA-161	Screw
	55.	CNV1063	Rack
	56.	CBL1003	Spring
	57.	CBA1052	Screw
	58.	CNC1068	Holder
	59.	CNV1055	Holder
	60.	CNV1059	Spacer
	61.	CGY1001	Pickup Unit
	62.	CNV1060	Guide
	63.	CNV1064	Spacer
	64.		Shaft
	65.	CNC1069	Holder
	66.		Chassis
	67.		Connector
	68.		Clamper
	69.	HEF-102	Clamper
	70.	CNV1081	Clamper
	71.	PMS26P040FUC	Screw
	72.		Bracket
	73.	CLA1093	Roller
	74.	CNM1056	Washer
	75.	CNM1118	Spacer
	76.		Plate
	77.	CNV1061	Guide
	78.	CNR1009	Magnet
	79.	CNM1055	Felt
	80.		Bracket
	81.	CXA1052	Arm Unit
	82.	CBH1010	Spring
	83.	CXA1167	Bracket Unit
	84.	CXA1062	Arm Unit
	85.	CNV1072	Lever
	86.		Shaft
	87.	CXA1455	Gear Unit
	88.	CLA1067	Roller
	89.	CLA1102	Collar
	90.	CBH1014	Spring
	91.	CNV1077	Cover
	92.	PMS20P025FMC	Screw
	93.	CNM1379	Sheet
	94.		Tray
	95.	CBA1026	Screw
	96.	CNV1071	Guide
	97.	CXA1064	Plate Unit
	98.	CBH1012	Spring
	99.	YE20FUC	Washer
	100.	CNV1074	Arm
	101.	CBH1013	Spring
	102.	CXA1060	Plate Unit
	103.	CXA1063	Arm Unit
	104.	CNV1073	Lever
	105.	CNP1202	P.C. Board
	106.	CNV1129	Guide
	107.	CBH1009	Spring
	108.	VACANT	
	109.	BMZ20P040FMC	Screw

15. ELECTRICAL PARTS LIST

NOTE:
When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω 56 × 10^1 561 .... RD1/4PS $\boxed{5}\boxed{6}\boxed{1}$ J
47kΩ 47 × 10^3 473........................ RD1/4PS $\boxed{4}\boxed{7}\boxed{3}$ J
0.5Ω 0R5 .... RN2H $\boxed{0}\boxed{R}\boxed{5}$ K
1Ω 010 .... RS1P $\boxed{0}\boxed{1}\boxed{0}$ K

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).
5.62kΩ 562 × 10^1.................................... RN1/4SR $\boxed{5}\boxed{6}\boxed{2}\boxed{1}$ F

- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★: GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts whose parts numbers are omitted are subject to being not supplied.*
- *The part numbers shown below indicate chip components.*
  Chip Resistor
  RS1/8S□□□J
  Chip Capacitor (except for CQS.....)
  CKS....., CCS.....

Main Assy

MISCELLANEOUS

Mark	Symbol & Description	Part No.
★★	IC1	CX20109
★★	IC2	IR3C05
★★	IC101	CX20108
★★	IC102, 103, 203, 307	M5218FP
★★	IC104, 105	PA3021A
★★	IC201	CX23035
★★	IC202	M5M5117FP
★★	IC204	PD8019E
★★	IC301	CX20133
★★	IC302, 304	M5221FP (NJM072M)
★★	IC303	TC4053BF
★★	IC305, 306	KHA210A
★★	IC401	M54546L
★★	Q101, 201, 303 Chip Transistor	UN2211
★★	Q202	UN221D
★★	Q301, 302 Chip Transistor	2SK508-K52 or 2SK508-K53
★★	Q304, 305 Chip Transistor	2SD1048-X6 or 2SD1048-X7 or 2SD1048-X8 or 2SC3326
★★	Q306, 307 Chip Transistor	UN2111
★★	Q401	2SC3074-Y
★	D101	MTZ5R6JC
★	D102 – 109	ERA82-004Y
★	D110	ERA15-02
★	D201 Chip Diode	MA151K

Mark	Symbol & Description	Part No.
★	D202, 203 Chip Diode	MA153
★	D204	KV1226Y
★	D301 Chip Diode	MA151WA
★	D401 Chip Diode	MA3075
	L1, 2 Ferri-Inductor	CTF1007
	L201 Coil	CTA1001
	L301 Inductor	CTF1006
★	TH1 Thermister	CCX-021
★★	VR1 Semi-fixed, 47kΩ (B)x4	CCP1003
★★	VR2 Semi-fixed, 10kΩ (B)x3	CCP1004
	X201 X'tal 8.467MHz	CSS1009
	X202 Ceramic Resonator	CSS-042
	X301 X'tal 35MHz	CSS1008
★★	FU1 Fuse, 4A	CEK1002

RESISTORS

Mark	Symbol & Description	Part No.
	R15	RS1/2P150JL
	R156	RS1P220JL
	R316–323 4.7kΩ	CCN-140
	Other Resistors (Chip Resistors)	RS1/10S□□□J

CAPACITORS

Mark	Symbol & Description	Part No.
	C1, 18	CSYA100M6R3OS
	C2, 6, 7, 16, 17, 19, 20, 101, 102, 107, 115, 119, 126, 130, 202 – 204, 206, 213	CKSYB103K50L
	C4, 5	CCSSL151J50L
	C8, 9, 15, 402	CEA220M10LS
	C10 Chip Capacitor	CSZSR47M20
	C11	CKSYB333K25
	C13, 14, 109	CCSSL101J50L
	C103 Chip Capacitor	CSZS220M10
	C104, 124	CEA100M6R3LS
	C105, 106	CEA010M50NPLL
	C108	CCSSL561J50L
	C110	CEA0RIM50NPLL
	C111, 112	CEA100M10NPLL
	C113, 207	CCSCH271J50L
	C114	CKSYB183K25L
	C116, 118	CKSYB563K25
	C120	CCSSL152J50L
	C121	CKSYB473K25
	C123, 306, 310, 311	CCSSL102J50L
	C125, 129, 205, 210, 211	CKSYB222K50L
	C127 1000µF/16V	CCH1003
	C128, 132	CEA100M10LS
	C133, 134, 218	CKSYF224Z25
	C135, 136	CSYA220M6R3OS
	C139, 224	CKSYB103K50L
	C201 Chip Capacitor	CSZS2R2M6R3
	C208, 209	CCSCH390J50L
	C212, 219, 220	CCSCH330J50L
	C214, 215, 302, 309	CSZA6R8M16L
	C216, 217	CCSCH220J50L
	C221, 222, 303 Chip Capacitor	CSZS010M10
	C225	CEA331M6R3L2
	C301, 313, 316, 317, 322 – 325, 329	CKSYB103K50L
	C304	CCSCH330J50L
	C307	CCSCH470J50L
	C308, 320, 321, 328	CSYA6R8M6R3OS
	C312	CKSYB103K50
	C314, 315	CEA220M6R3LS
	C318, 319	CCSSL391J50L
	C326, 327 33µF/6.3V	GGF-809
	C330, 401	CKSYB103K50L

Power Supply Assy

MISCELLANEOUS

Mark	Symbol & Description	Part No.
★★	IC601 Converter	KHA803
★★	Q601	2SB822F
★★	Q602 Chip Transistor	UN2211
★	D601, 602, 604, 605	ERA15-02
★	D603 Chip Diode	MA3120
	L601, 602 Coil	CTH-035
	L603 Coil	CTH1006
	L604 Ferri-Inductor	CTF-078
	L605 Transformer	CTX1005
★	ZNR601 Surge Absorber	ERZ-C07DK220

RESISTORS

Mark	Symbol & Description	Part No.
	R601 – 610	RS1/8S□□□J

CAPACITORS

Mark	Symbol & Description	Part No.
	C601, 602, 604, 605, 608, 610, 614, 616 – 618	CKSYF473Z50
	C603, 606 1000µF/16V	CCH1003
	C607, 609	CEAUH221M10
	C611	CEA101M16LL
	C612	CSYA1R5M25OS
	C613	CEA330M25LL
	C615	CEA330M35LL
	C619, 621 Filter	CCG1001
	C620	CCG-104

Display Unit

MISCELLANEOUS

Mark	Symbol & Description	Part No.
★★	IC701	PD4074D
★★	IC702	M51956BL
★★	Q701	2SD1226M
★★	Q702, 708, 709 Chip Transistor	UN2111
★★	Q703 – 705, 707, 710, 711 Chip Transistor	UN2211
★★	Q706	2SB822F
★★	Q712 Chip Transistor	2SD601-YQ or 2SD601-YR or 2SC2712-LG or 2SC2712-LL
★	D701	HZ6LB1
★	D702 Chip Diode	MA3068
★	D703 – 706 Chip Diode	MA151K
★	D707 – 711, 716 – 718 LED	BG4524K
★	D712 – 714, 719, 720 LED	LN31GC6
★	D715 LED	LN81RC5V
★	D721 Chip Diode	MA3200
	X701 Ceramic Resonator	CSS-049
	X702 Buzzer	CPV1005
★★	S701 – 711 Switch	CSG-255
	FL Tube	CAW1003

RESISTORS

Mark	Symbol & Description	Part No.
	R722 – 727	RS1/2P□□□JL
	Other Resistors	RS1/8S□□□J

CAPACITORS

Mark	Symbol & Description	Part No.
	C701	CKSYB103K50
	C702	CEA101M6R3LS
	C703, 704	CCSCH330J50
	C705	CEA220M16LS

Switch P.C. Board

Mark	Symbol & Description	Part No.
★★	S2, 3 Switch (Push, Disc)	CSN-094

Motor P. C. Board

Mark	Symbol & Description	Part No.
★★	M1 Motor Unit (Carriage)	CXA1188
★★	S1 Switch (Home)	CSN-094

Logic Unit

Mark	Symbol & Description	Part No.
★★	IC951	TC4066BF
	R951 – 954 Chip Resistor	RS1/10S□□□J
	C951 Chip Capacitor	CSZS010M10TL
	C952	CKSQYB103K50

Miscellaneous Parts List

Mark	Symbol & Description	Part No.
	Pickup Unit	CGY1001
★★	M2 Motor Unit (Spindle)	CXM1005
★★	M3 Motor Unit (Loading)	CXA1189
★★	S4, 5 Switch (Front, Rear)	CSN-094

16. PACKING METHOD

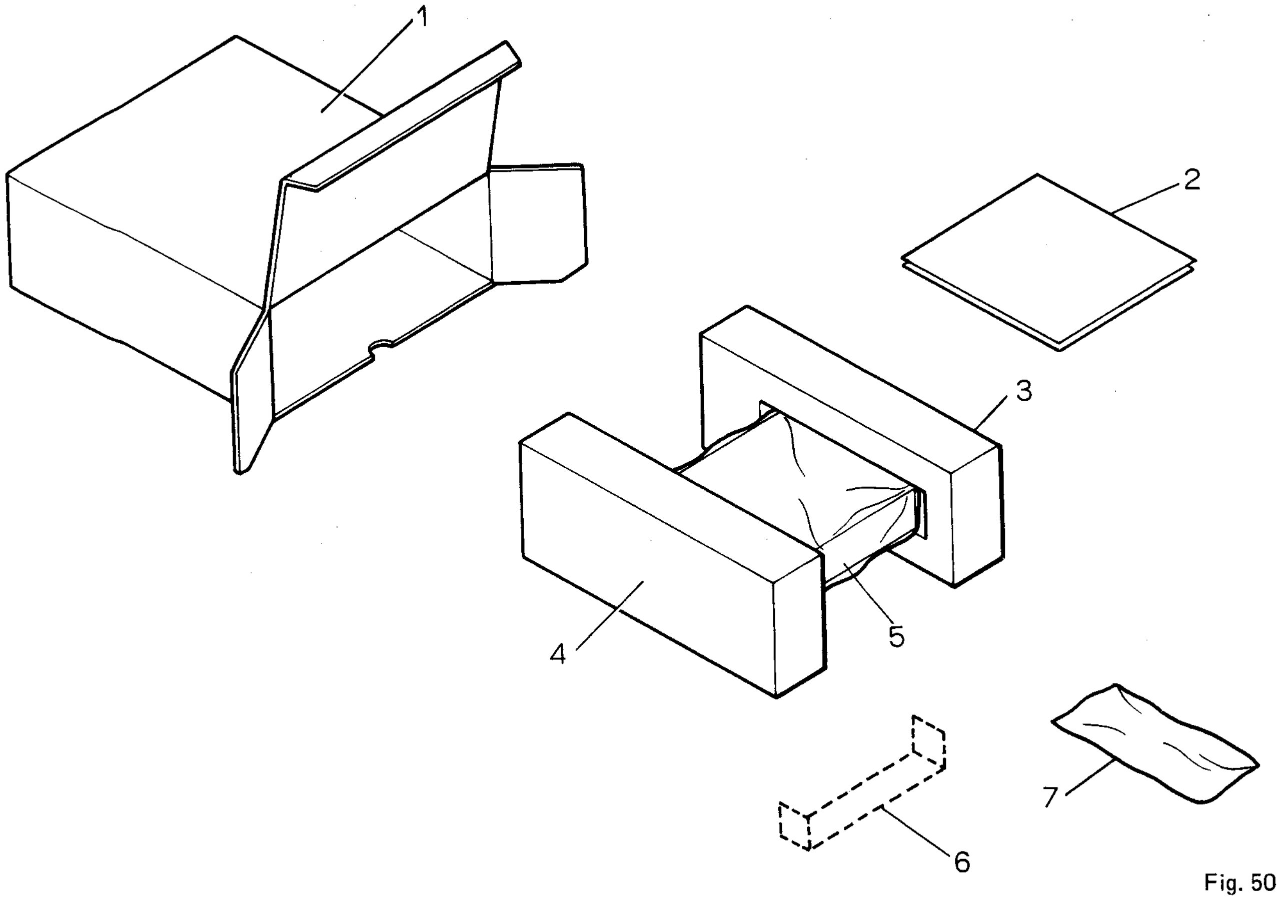


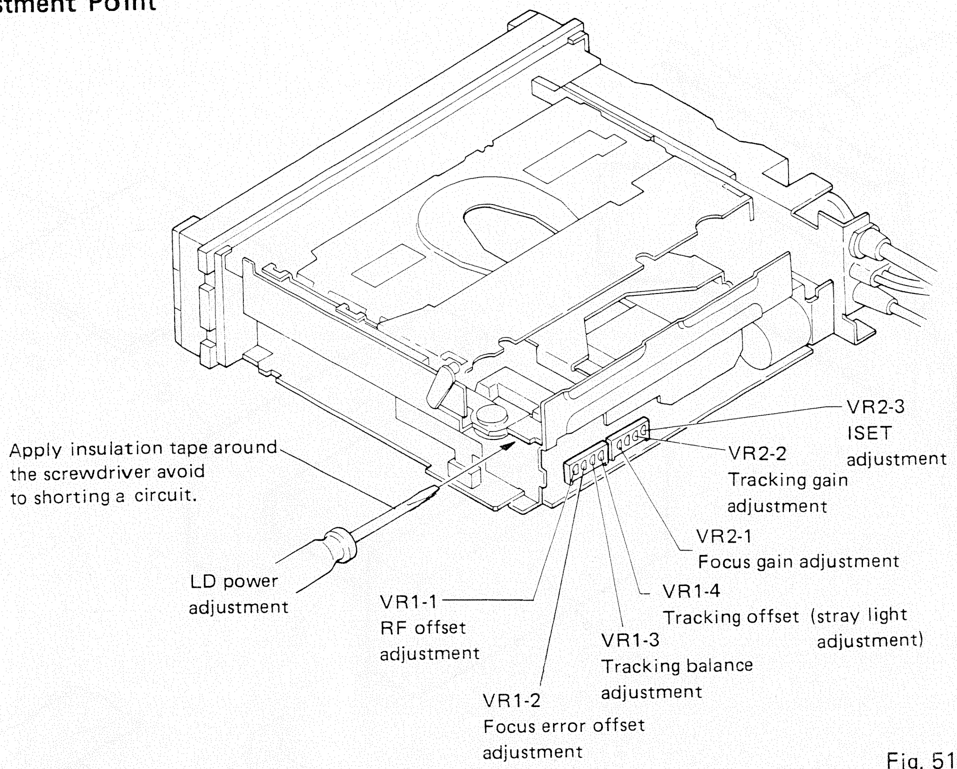
Fig. 50

• Parts List

Mark	No.	Part No.	Description
	1.	CHG1077	Carton
	2.	CRD1041	Owner's Manual (English, French, German, Spanish)
		CRD1042	Owner's Manual (Swedish, Norwegian, Dutch, Italian)
			Card
	3.	CHP1036	Styrofoam (L)
	4.	CHP1037	Styrofoam (R)
	5.	CEG-114	Cover
		CRP1004	Caution Card
	6.	CNB-723	Mounting Bracket
	7.	CEA1108	Accessory Kit
	7-1.	CNF-111	Strap
	7-2.	CNN-058	Spacer
	7-3.		Screw Kit
	7-3-1.	CBA-102	Screw
	7-3-2.	HMF40P080FZK	Screw
	7-3-3.	NF50FMC	Nut

17. ADJUSTMENT

● Adjustment Point

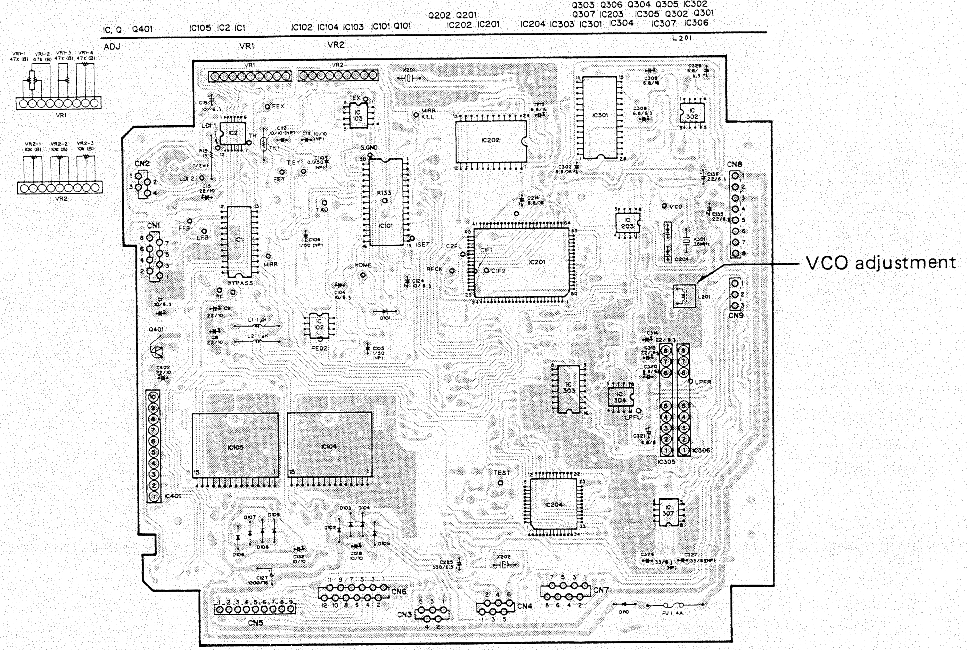

Apply insulation tape around the screwdriver avoid to shorting a circuit.
LD power adjustment
VR1-1 RF offset adjustment
VR1-2 Focus error offset adjustment
VR1-3 Tracking balance adjustment
VR1-4 Tracking offset (stray light adjustment)
VR2-1 Focus gain adjustment
VR2-2 Tracking gain adjustment
VR2-3 ISET adjustment

See Fig. 67 for tangential adjustment and grating adjustment points.

Fig. 51

● Test Point

MAIN ASSY


IC, Q
Q401
IC105 IC2 IC1
IC102 IC104 IC103 IC101 Q101
Q202 Q201
IC202 IC201
IC204 IC303 IC301 IC304
Q303 Q306 Q304 Q305 IC302
Q307 IC203 IC305 Q302 Q301
IC307 IC306
ADJ
VR1
VR2
L201
VR1-1 47k (B)
VR1-2 47k (B)
VR1-3 47k (B)
VR1-4 47k (B)
VR2-1 10k (B)
VR2-2 10k (B)
VR2-3 10k (B)
CN1
CN2
CN3
CN4
CN5
CN6
CN7
CN8
CN9
VCO adjustment

IC1 : CX20109 IC2 : IR3C05 IC101 : CX20108 IC102, 103, 203, 307 : M5218FP IC104, 105 : PA3021A IC201 : CX23035 IC202 : M5M5117FP
IC204 : PD8019E IC301 : CX20133 IC302, 304 : M5221FP or NJM072M IC303 : TC40538F IC305, 306 : KHA210 IC401 : M54546L Q101 : 2SD1048-X6, X7, X8
Q201, 303 : UN2211 Q202 : UN2210 Q301, 302 : 2SK508-K52, K53 Q304, 305 : 2SD1048-X6, X7, X8 or 2SC3326 Q306, 307 : UN2111 Q401 : 2SC3074-Y
D101 : MTZ5R6JC D102～109 : ERA82-004Y D201 : MA151K D202, 203 : MA153 D204 : KV1226Y D301 : MA151WA D401 : MA3075 D110 : ERA15-02

Fig. 52

• Test Mode

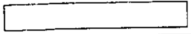
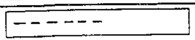
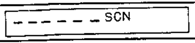
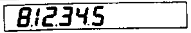
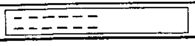
1) Starting

Starts by simultaneously pressing [TR+] [TR−] [Clear] to light all displays.

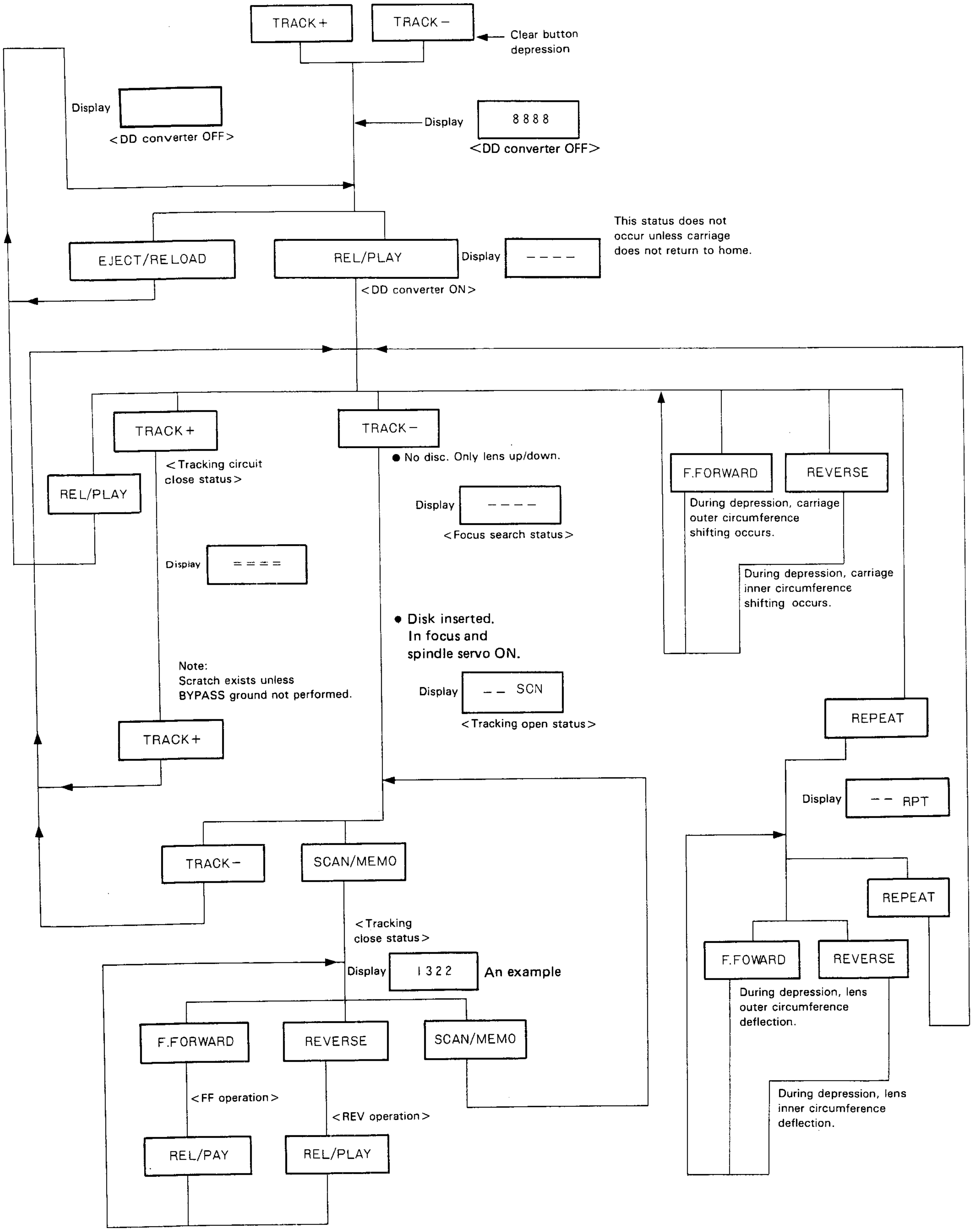
2) Functions

Button name	Operation
EJECT/RELOAD	Disc load, eject.
REL/PLAY	DD converter ON, OFF. However, during continuous jump, play occurs with jump release.
F·FORWARD REVERSE	* In case DD converter is ON, Focus tracking OFF. ● Repeat display OFF Carriage FWD/REV ● Repeat display ON Tracking actuator FWD/REV *In case DD converter is ON, Focus tracking ON. ● FWD/REV continuous jump
TRACK+	Carriage, tracking loop switch individual ON-OFF. (IC101 CX20108 system adjustment function)
TRACK–	Focus search ON-OFF
SCAN/MEMO	Tracking servo ON-OFF
REPEAT	* In case DD converter is OFF All display segments ON-OFF. * In case DD converter is ON. REPEAT display ON-OFF (FWD/REV function selection).

3) Display

Display	Status
	Indicates DD converter OFF. However, all lighting enabled by REPEAT.
	Indicates DD converter ON.
	Indicates DD converter ON. Focus closed.
	Indicates tracking close.
	Indicates tracking close, non-drive.

4) Flow chart


TRACK+
TRACK−
Clear button depression
Display
<DD converter OFF>
Display
8888
<DD converter OFF>
EJECT/RELOAD
REL/PLAY
Display
− − − −
This status does not occur unless carriage does not return to home.
<DD converter ON>
TRACK+
TRACK−
REL/PLAY
<Tracking circuit close status>
● No disc. Only lens up/down.
Display
− − − −
<Focus search status>
Display
= = = =
● Disk inserted. In focus and spindle servo ON.
Display
− − SCN
<Tracking open status>
Note: Scratch exists unless BYPASS ground not performed.
TRACK+
F.FORWARD
REVERSE
During depression, carriage outer circumference shifting occurs.
During depression, carriage inner circumference shifting occurs.
REPEAT
Display
− − RPT
REPEAT
TRACK−
SCAN/MEMO
<Tracking close status>
Display
1322
An example
F.FORWARD
REVERSE
SCAN/MEMO
<FF operation>
<REV operation>
REL/PAY
REL/PLAY
F.FOWARD
REVERSE
During depression, lens outer circumference deflection.
During depression, lens inner circumference deflection.

Step No.	Oscilloscope range		Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
	X	Y				
1						**Measuring instrument and jig used** • Two-channel oscilloscope with delayed sweep. • Optical power meter (LEADER: LPM8000) • Test disc (SONY TEST CD TYPE 4 YEDS-18) (TYPE 3 YEDS-7 is usable.) • Two needle voltmeter • DC power supply (More than 5A) • Gain adjustment filter • CR oscillator • Extension connector **Precautions** • Oscilloscope used must have a 10:1 probe as a rule. • Waveform photos are taken by using a 100 MHz oscilloscope. • When the laser is on, do not look into the object lens. **Preparation** • Remove the case top and chassis. **Test mode entry** Press the clear button while simultaneously pressing TRACK+ TRACK− (or turn ACC, BACK UP on instead of pressing the clear button). 888888 is displayed. **Turn the DD converter on.** Press the REL/PLAY key. – – – – – – – is displayed. **Actuator, motor operation confirmation** • Carriage motor Confirm that the pickup shifts toward the outer circumference by pressing the F. FORWARD key and toward the inner circumference by pressing the REVERSE key. Then shift it to the extreme outer circumference. • **Focus actuator** When the TRACK− key is pressed, it is shifted downward first. After this, it shifts smoothly up and down about 1mm. When TRACK− is pressed again, lens up and down movement stops and the DD converter returns to an ON status. – – – – – – – is displayed. • **Tracking actuator** Press the REPEAT key. – – – – – – – RPT is displayed.

Step No.	Oscilloscope range		Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
	X	Y				
						Confirm that the lens shifts toward the outer circumference when the F. FORWARD key is pressed and toward the inner circumference when the REVERSE key is pressed. Lens shift is about 0.2mm. Press the REPEAT key to return the DD converter to an ON status. – – – – – – is displayed.
2				VR in the pickup.	250±20μW	**LD power confirmation and adjustment** • Place a power sensor on the pickup object lens. • If it is outside the proper range, quickly adjust VR in the pickup so that it is within the proper range. (Increased by clockwise movement). • Turn it slow so that the meter index swing is not excessive.
3			RF	VR1-1 (RF)	0.1±0.1V	**RF offset adjustment** • DD converter - ON. Perform this without a disc.
4			EFB FFB	VR1-3 (T.B)	0±0.5dB	**Tracking balance rough adjustment** • Insert a disc and set it by pressing the EJECT /RELOAD key twice. • Turn the DD converter ON by pressing the REL/PLAY key. • Obtain focus by pressing the TRACK- key to enter a tracking open status. • Adjust the AC component level of sub beam output EFB, FFB by using a two needle voltmeter so that the level difference is a standard value.
5			TAO	VR1-4 (T.O)	0±50mV	**Stray light adjustment** • After ejecting a disc by pressing the EJECT /RELOAD key, remove the disc. • Provide the DD converter with an ON status by pressing the REL/PLAY key. • Provide the non-drive tracking circuit with a close status.
		(While the tracking loop has an ON status.) → (Tracking actuator, carriage - PWM non-drive) →				MIRR KILL: "L" - - - Grounded to S. GND BYPASS: "L" - - - - Grounded to S. GND If this is not performed, the actuator might be damaged by fire. Press the TRACK+ key. * MIRR KILL: "L" can be preset. BYPASS: "L" shall occur after DD converter ON. = = = = = = is displayed. • Adjust it so that it is within the range. • After adjustment, return the DD converter to an ON status by pressing the TRACK+ key. • BYPASS: "L" release.

Step No.	Oscilloscope range		Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
	X	Y				
6	50mV/div	200ms/div	TAO	VR1-3 (T.B)	0±500mV	**Tracking balance fine adjustment** • Insert a disc and set it by pressing the EJECT /RELOAD key twice. • Press the REL/PLAY key to provide a DD converter ON status. • Enter a non-drive tracking close status. After entering a tracking open status by pressing the TRACK− key, BYPASS entry: "L", MIRR KILL: "L", then press the SCAN key. • Adjust it so that the average value of the TAO 1 Hz low pass filter output is zero for several seconds. • When you are not certain, repeat this by inserting a disc again. • Enter a tracking open status by pressing the SCAN key, and BYPASS: "L" release and MIRR KILL: "L" release. Then return the DD converter to an ON status by pressing the TRACK− key. • After the above procedure has been terminated, confirm the stray light adjustment again. If it is within 50mV, it is OK. If it is more than 50mV, perform the stray light adjustment and tracking balance fine adjustment again.
7	50mV/div	0.5μs/div	RF			**Tangential skew confirmation** • Enter a normal mode. (Repress the clear button or ACC, BACK UP.) • Set the disc and play back the TNO 7 (TYPE3: TNO 23). • Confirm that the RF waveform 11T peak and trough are even. (Fig. 57−59) • If there is an adjustment deviation, perform tangential skew adjustment (to be explained later).

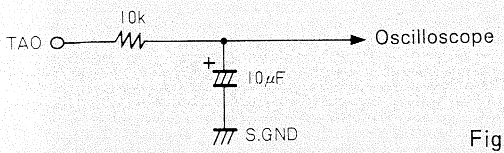
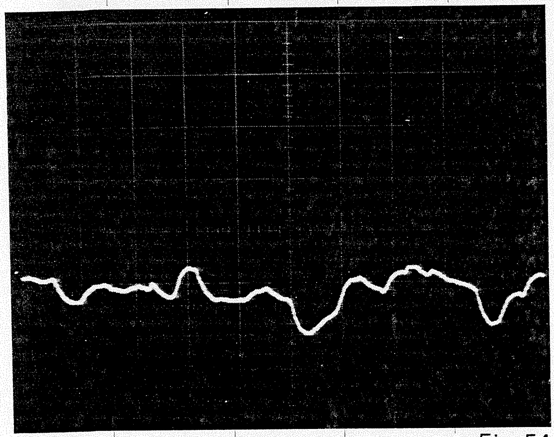
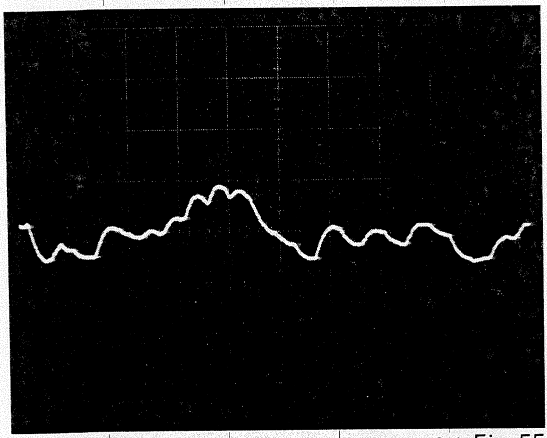


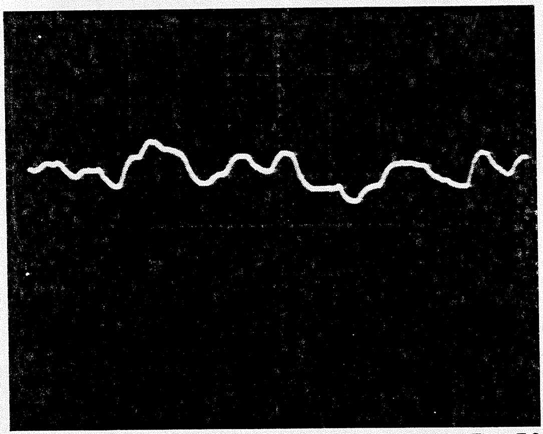
Fig. 53



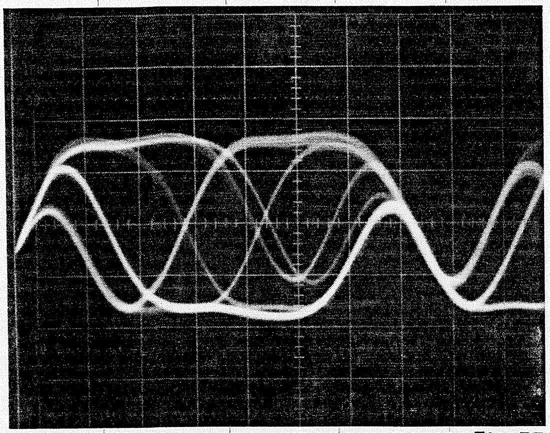
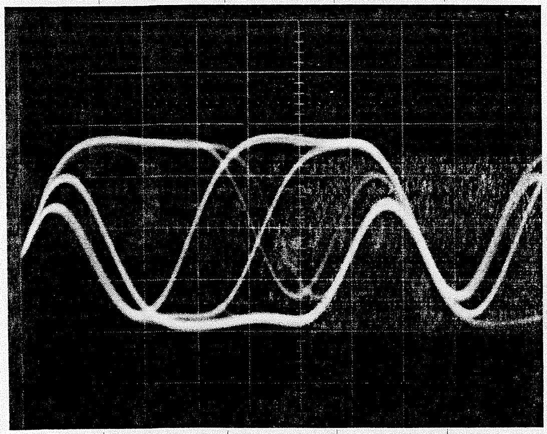
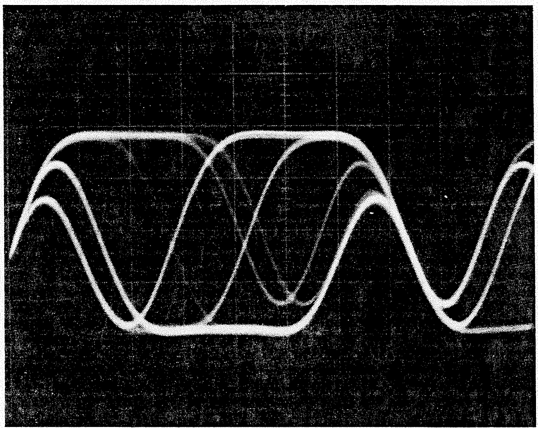
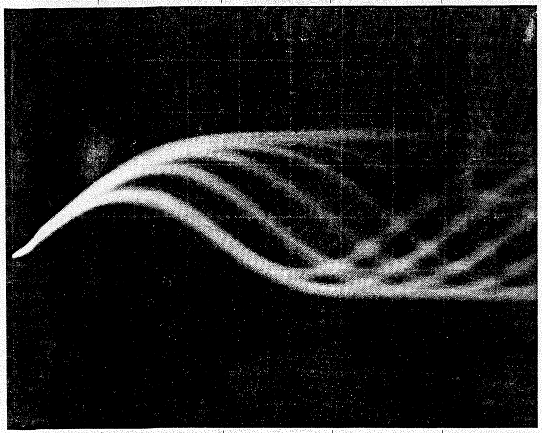
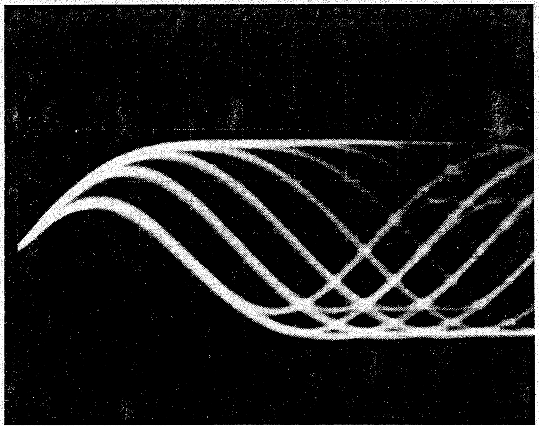
NG Fig. 54



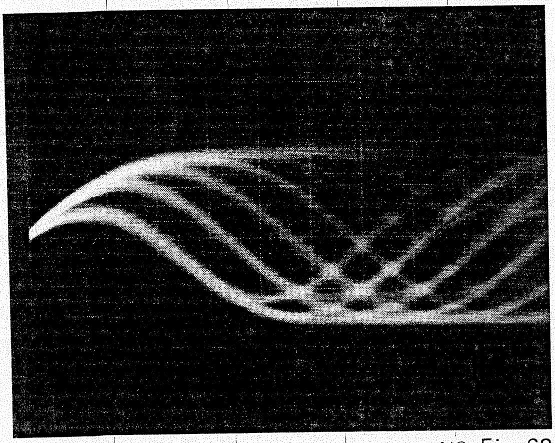
OK Fig. 55



NG Fig. 56

Step No.	Oscilloscope range		Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
	X	Y				
	 NG Fig. 57  NG Fig. 59					 OK Fig. 58
8	50mV/div	0.2µs/div	RF	VR1-2 (FE. OFFSET)		**Focus offset adjustment** • Play back the TNO 12 and adjust it so that RF is around maximum and the best eye pattern is obtained (TYPE3: TNO 14).
	 NG Fig. 60					 OK Fig. 61

Step No.	Oscilloscope range		Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
	X	Y				
9			FEY FEX	VR2-1 (FG)	$0^{+0.6}_{-0.3}$dB	**Focus servo gain adjustment** • Make the wiring as shown in the figure. • Set the oscillator output to 1 kHz, 50mVrms. • Play back the TNO 12, then adjust it so that the X, Y reading difference is within the range. (TYPE3: TNO 14).



NG Fig. 62

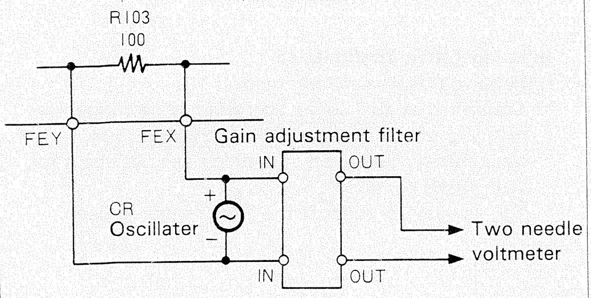
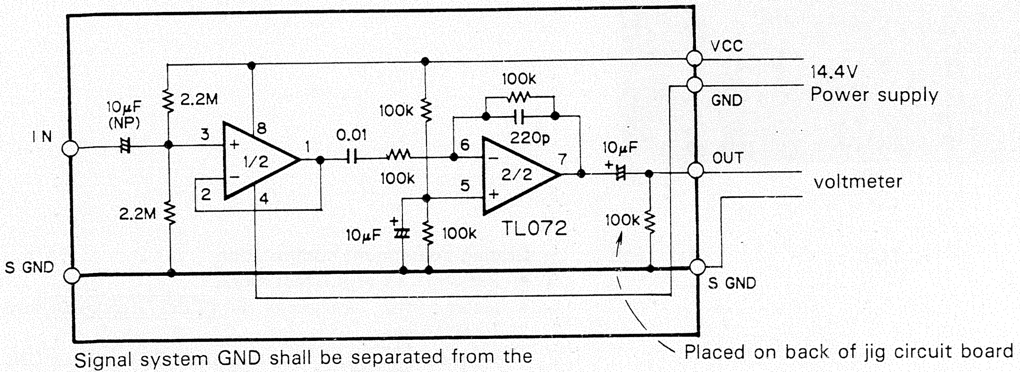

R103
100
FEY
FEX
Gain adjustment filter
IN
OUT
CR
Oscillater
+
–
Two needle
voltmeter
IN
OUT

Fig. 63

Gain adjustment filter (only one channel shown)


VCC
14.4V
Power supply
GND
IN
10µF
(NP)
2.2M
3
8
1/2
2
4
1
0.01
100k
100k
100k
220p
6
5
2/2
7
10µF
OUT
voltmeter
2.2M
10µF
100k
TL072
100k
S GND
S GND
Placed on back of jig circuit board

Signal system GND shall be separated from the power supply GND.

Fig. 64

Step No.	Oscilloscope range X	Oscilloscope range Y	Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
10			TEY TEX	VR2-2 (TG)	$0^{+0.6}_{-0.3}$dB	**Tracking servo gain adjustment** • Make the wiring as shown in the figure. • Set the oscillater output to 1.4 kHz, 50mVrms. • Play back the 12th music, then adjust it so that the X, Y reading difference is within the range.

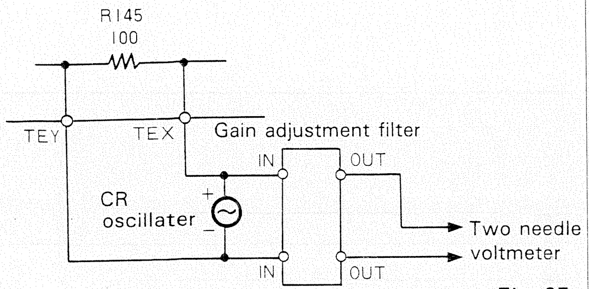


Fig. 65

11			ISET R133	VR2-3 (ISET)	3.6V±0.1V	**ISET confirmation** • Confirm that the voltage at both ends of R133 is within the range. • If it is outside the range, adjust it.
12	CH1 100mV/div CH2 50mV/div	5ms/div 5ms/div	TEY TAO			**Jump operation confirmation** • Perform this in a normal mode. • Confirm that the Jump operation is performed by pressing the F. FORWARD , REVERSE key. Also confirm that jump operation does not occur for two tracks or more. This is easy to check if the TAO trigger is used.

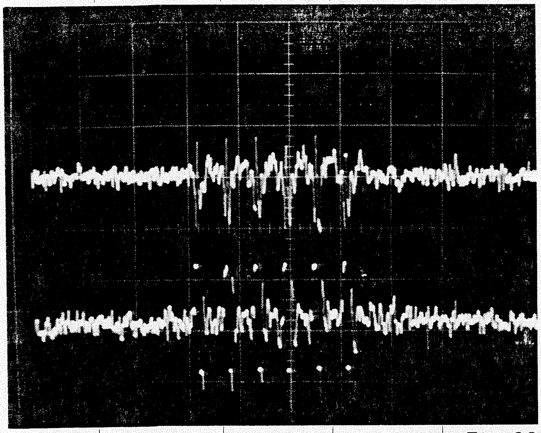


Fig. 66

13			TEY		0±1.5dB	**Grating adjustment confirmation** • Perform this in the test mode. • Insert a disc, and press the EJECT/RELOAD key twice to set it. • Press the REL/PLAY key to turn the DD converter ON. • Press the TRACK− key to obtain focus and enter a tracking open status. • Play back the TNO 6. (TYPE3: TNO 7) • Make the TE level standard while playing back the TNO 6. • Confirm that the difference for the TE level of the TNO 1 (TYPE3: TNO 1) and that for the TNO 20 (TYPE3: TNO 50) is within the range.

Step No.	Oscilloscope range X	Oscilloscope range Y	Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
						• When it is outside the range, if eccentricity is within the range, perform the grating adjustment.
14			RF	TAN adj. screw		**Tangential adjustment** • When this adjustment is performed, be sure to perform the grating adjustment. • Perform this in a normal mode. • Play back the TNO 7, then adjust this so that the RF waveform peak becomes flat. (TYPE3: TNO 23) • After adjustment completion, apply screw lock.

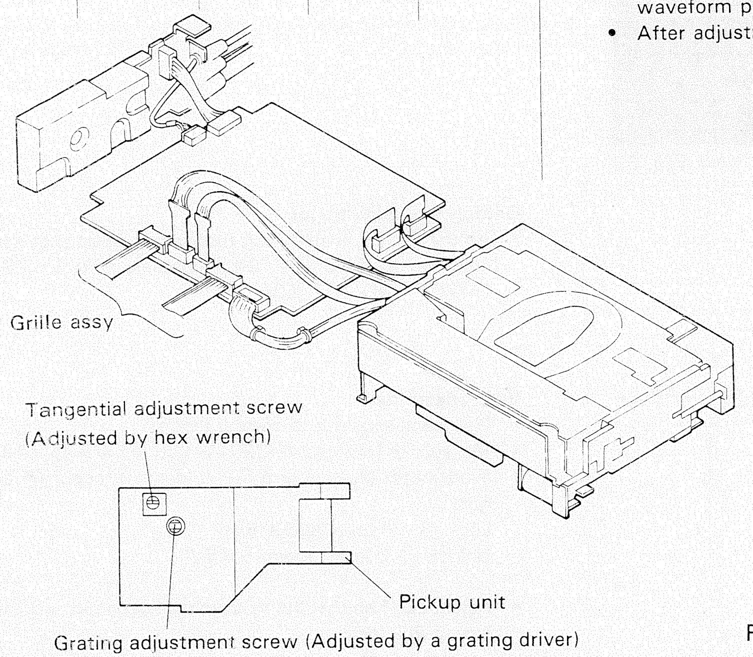

Grille assy
Tangential adjustment screw
(Adjusted by hex wrench)
Pickup unit
Grating adjustment screw (Adjusted by a grating driver)

Fig. 67

Step No.	Oscilloscope range X	Oscilloscope range Y	Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
15	50mV/div	20ms/div	TEY			**Grating adjustment** • Insert a disc and set it by pressing the EJECT/RELOAD key twice. • Press the REL/PLAY key to turn the DD converter ON. • Press the TRACK− key to obtain focus and to enter a tracking open status. • Play back the TNO 6. (TYPE3: TNO 7) • Measure the tracking error waveform by using an oscilloscope. At this time, insert a 4 kHz cutoff low pass filter. • Adjust it with the grating driver and find a status in which the main beam and sub beam are on one track (nullpoint). * There are many cases in which tracking error is minimized. The null point provides a status in which the envelope is cleanest and has less noise. • While slowly turning the grating driver clockwise starting from the null point, adjust it to the point where the waveform (tracking error signal) amplitude becomes maximum first.

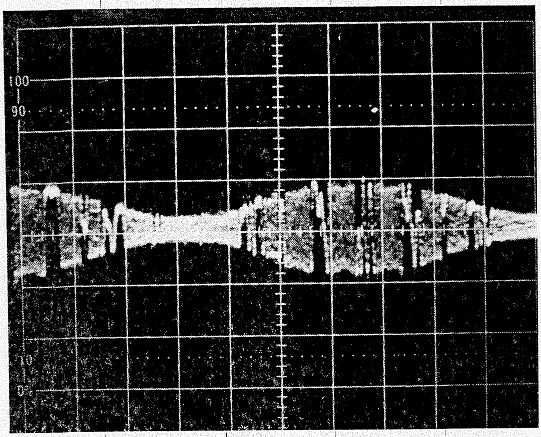
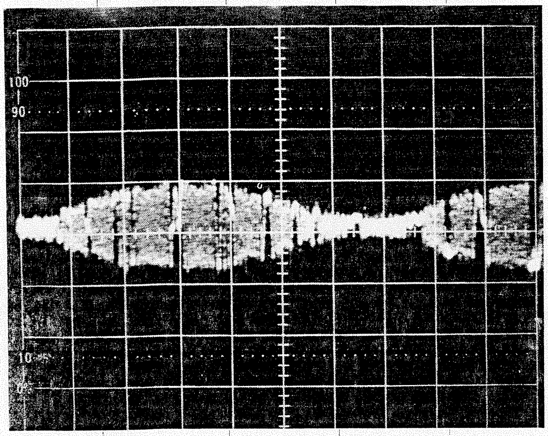


Fig. 68

Step No.	Oscilloscope range		Test point	Adjustment point	Confirmation /adjustment specification	Adjustment procedure
	X	Y				
	 NG Fig. 69					* If the driver is pressed too strongly, the pickup mainframe is lifted. Therefore, precautions shall be taken concerning this.
16						**Grating fine adjustment** • Adjust the TE level during tracking open so that the level for the TNO 1, 6, 20 becomes within 1.5 dB. (TYPE3: TNO 1, 7, 50)
17			VCO	L201	−0.5V	**VCO adjustment** • Play back music in a normal mode. • Measure the voltage at IC201 pin 28 (GFS) with a milivolt meter and confirm if PLL lock has occurred or not. Lock - - - H level about 5V Unlock - - L level about −0.5V • Adjust L201 so that the VCO voltage becomes −0.5V during PLL lock.